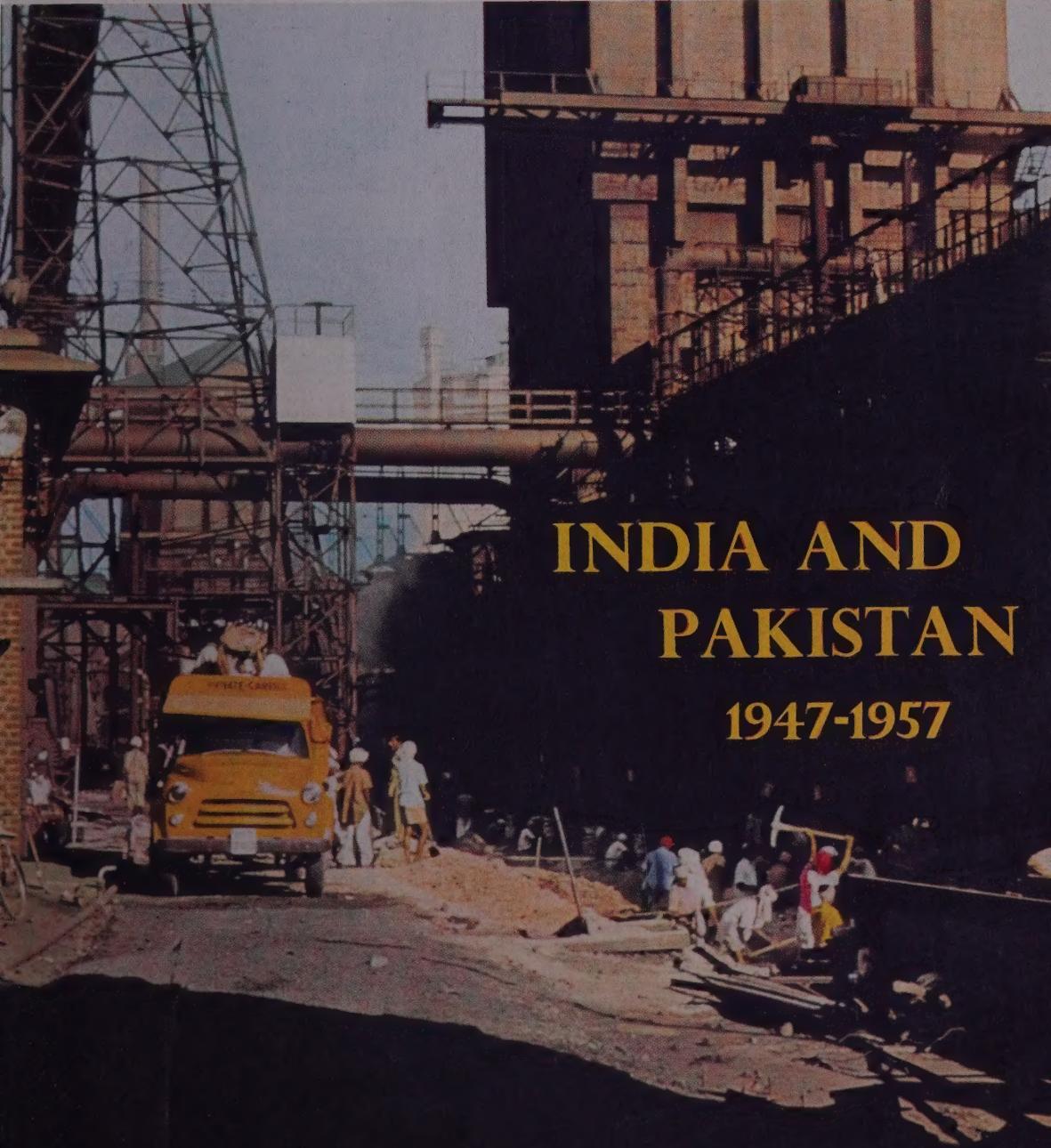


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# GEOGRAPHICAL

## MAGAZINE



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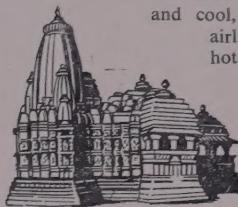
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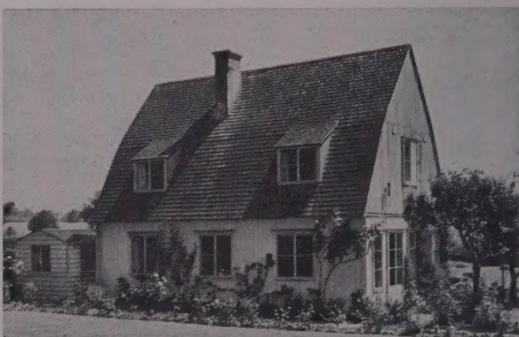
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# Cautley and the Ganges Canal

by R. M. PANJABI

*The Romans are chiefly remembered in Britain by their roads; perhaps the chief memorial to the British in India and Pakistan will be their canals and irrigation works. One of the greatest of these—a gigantic project then and one that has proved increasingly useful ever since—was completed more than a century ago; an Indian journalist tells by whom and against what opposition*

EARLY last year a new hydro-electric plant was switched on in northern India. Known as the Pathri Powerhouse, it is the eighth and the final to be installed on the Ganges Canal. It brings to a climax a story that goes back more than a hundred years.

This area of northern India is called the Doab—or “Two Waters”—as it forms the watershed between the upper reaches of the Ganges and the Jumna rivers. In the lower plains, where their annual floods spread fertility over huge tracts of land, these rivers have always brought prosperity: but not so in the Doab—here their rapid flow and high banks prevent use of the water without a system of irrigation. Such was the drought in the area that devastating famines were a normal feature of life. In 1854 a miracle happened that banished this spectre for ever. The Ganges Canal was opened.

The man who brought to reality this dream of centuries was Proby Thomas Cautley, an artilleryman turned engineer, who had to overcome not only all the natural obstacles that had baffled his predecessors, but also new man-made ones. It required more than a touch of genius.

Born in Suffolk in 1802, Cautley came to India at the age of seventeen and joined the Bengal Artillery, in which he served with distinction. In 1825 he was assigned to Captain Robert Smith, of the Bengal Engineers, then supervising construction of the Eastern Jumna Canal, which became the first successful attempt to irrigate the Doab; an earlier canal designed in the days of Emperor Shah Jahan, the builder of the Taj Mahal, having failed due to faulty alignment. Cautley took to engineering like a child to candy, and made rapid advances in the profession. By 1836 he was Superintendent-General of Canals.

The ambitious project of a canal from the Ganges had his early support, though at first it appeared almost impossible to build. The country was uneven; the river flowed at a steep gradient; and the quantity of water to be handled varied extraordinarily, the mon-

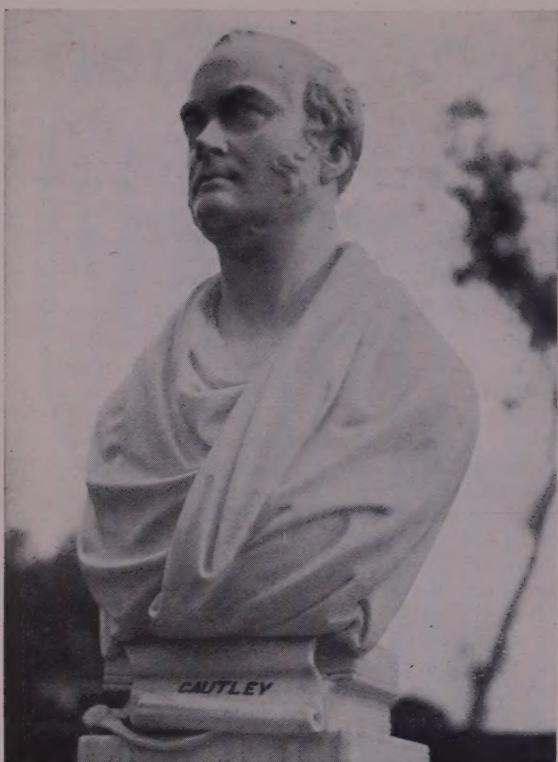
soon flow often being a hundred times that in winter. An even greater obstacle were the many torrents and monsoon-rivers that cut across the course of the proposed canal.

It was only the shock of the events of 1837 that made the Administration investigate the scheme. That year the rains failed so completely in the Doab that the ensuing famine, and the misery it brought, is still remembered. The loss to the Provincial Government alone was over £1,000,000 sterling. The only green that year was in the fields bordering the new Jumna Canal.

Cautley at last received orders to survey for the Ganges Canal, but found that the grant sanctioned was insufficient to hire even one qualified assistant. It seemed as if the Government had decided beforehand that the money was being thrown away. Cautley's reaction was characteristic. He set out on his mission alone, with only a few servants to carry his tents and provisions. For six months the Superintendent-General walked and rode across swamps and jungles, taking each level and measurement himself, and then sitting up at nights to transfer them to his maps. After this drudgery he was confident that the 300-mile canal could be made. Though mainly for irrigation, it was also to be navigable by barges.

His report, after showing the drawbacks inherent in all plans of diverting the canal to avoid interference from the torrents, boldly proposed that it be taken in a direct line, being made to go over or under the offending streams, as occasion offered! As this would involve construction of a costly three-mile aqueduct—the longest in the world at that time—he did not forget to add, for the benefit of the East India Company directors, that the whole investment would pay handsome dividends.

But, in the absence of a precedent, and harassed by the Afghan wars, the officials hesitated to back such a tremendous project. They raised a great many objections to it, which ranged from the difficulty of getting materials and artisans in the region to the



(Left) Sir Proby Thomas Cautley, K.C.B., the projector and constructor of the Ganges Canal, that tremendous undertaking which he began in 1839 in the teeth of official opposition after months of patient survey work. Now more useful than ever, the canal irrigates 1,700,000 acres and provides hydro-electric power for eight stations. This bust of Cautley, made when he was forty-five years old, is in the library of Roorkee University, which originated as a small college started by Cautley to train his technicians working on the canal and is now the only university in India that is devoted exclusively to engineering. (Below) A hundred and eighty miles from its source in the Himalayas, the Ganges descends to the plains near Hardwar. Cautley built the headworks of his canal on the banks of the stream in the foreground

All photographs by the author

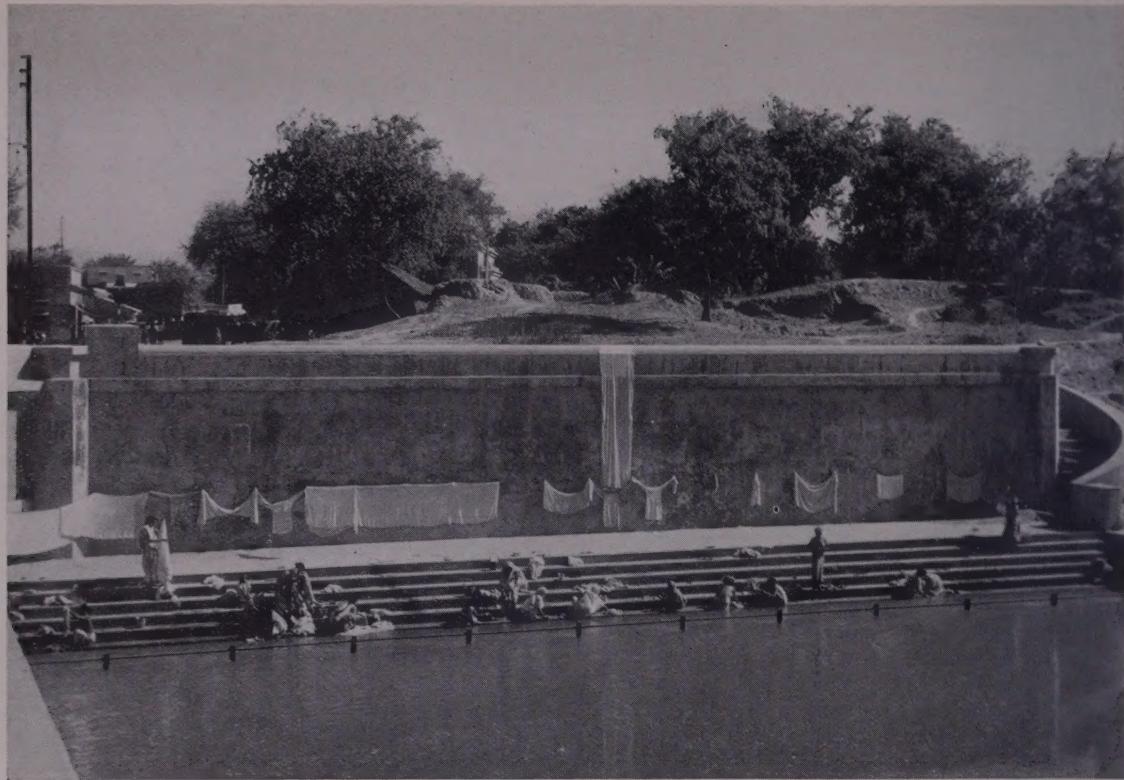




(Above) *The Solani Aqueduct, three miles long, carries the Ganges Canal over a giant hollow ending at Roorkee. It crosses the Solani, a torrential tributary of the Ganges, by means of a bridge some 400 yards in length. Before it was begun there was considerable controversy about the siting of the head of the canal. Cautley chose a site near the foot of the Himalayas as providing a better base for the works regulating the supply, despite the fact that this meant that the canal would have to cross numerous similar torrents.*

(Right) *Huge lions guard each end of the aqueduct. Like everything else in the canal's construction they are of brick and covered with a red mortar of lime and powdered brick. Cautley refused to have marble statues erected in their place, preferring the humbler building-materials which had served him so well*





*Beside each of the 103 bridges over the canal, Cautley built bathing-steps like these. They are still in constant use by people who come to bathe, wash clothes or teach their children swimming*

danger of a chance earthquake destroying the aqueduct. With facts and figures these could be countered, but winning arguments and getting money are different things. Cautley, with the fervour of one working for a new religion, succeeded in both.

Some opposition also came from the local Hindu priests who felt that the waters of the Ganges, worshipped by hundreds of millions in India, were being imprisoned. Cautley satisfied the literal among them by agreeing to leave a narrow gap in the dam through which the river could always flow unchecked, and overwhelmed all when he inaugurated his works with Hindu ritual and with repairs to the holy bathing-steps along the river.

Digging was started in December 1839, but was soon suspended as new doubts assailed the authorities. The apparent cause this time was only a decimal point. Cautley had by mistake put this one digit further to the right in some figures, thereby exaggerating the prospects of the scheme. This, the Government claimed, cast a doubt on all his calculations.

So a year was wasted while a committee checked all Cautley's measurements in the field. They reached the rather surprising conclusion that Cautley's levels and surveyings, made unassisted and under great handicaps, were completely reliable and that his plans could all be put through with very small changes. This impressed at least the Provincial Government, who now began to support Cautley. But opposition developed in higher quarters.

The Governor-General of India at this time was Lord Ellenborough, whose declared motto was "Peace in Asia", which he believed could only be achieved by military conquest. The wars with Afghanistan, the campaigns against the Sikhs and the Mahrattas and several smaller battles, were all fought during his term. As a result the Treasury was chronically empty, and Lord Ellenborough considered as very rude anyone asking money for a civilian project. In 1842 he issued flat orders that work on the canal be completely stopped, and asked for the closing accounts to be sent in.

It was only at the strong intervention of the Provincial Government that he relented somewhat and permitted a small annual grant. In spite of these restrictions Cautley carried on with the work, but in 1845, after twenty-six years' service in India, his health broke down. Reluctantly, he decided to go on home leave.

Even in England the Ganges Canal remained his main preoccupation. He met members of the Government and other leaders, and urged upon them the importance of irrigation to Indian agriculture, and the canal's role in this. His efforts bore fruit for, when he returned to India three years later, he found the climate of opinion completely changed. On the way back he spent several weeks studying the canals in Italy and the great works in progress on the Nile Delta.

In Cautley's absence, also, war continued to hinder the canal. There was a fierce Sikh incursion and Major Baker, who was in charge, and both his English assistants were called out to active duty, putting an end to all work while the fighting lasted. Even so, the main regulator, some bridges, and forty miles of channel were completed.

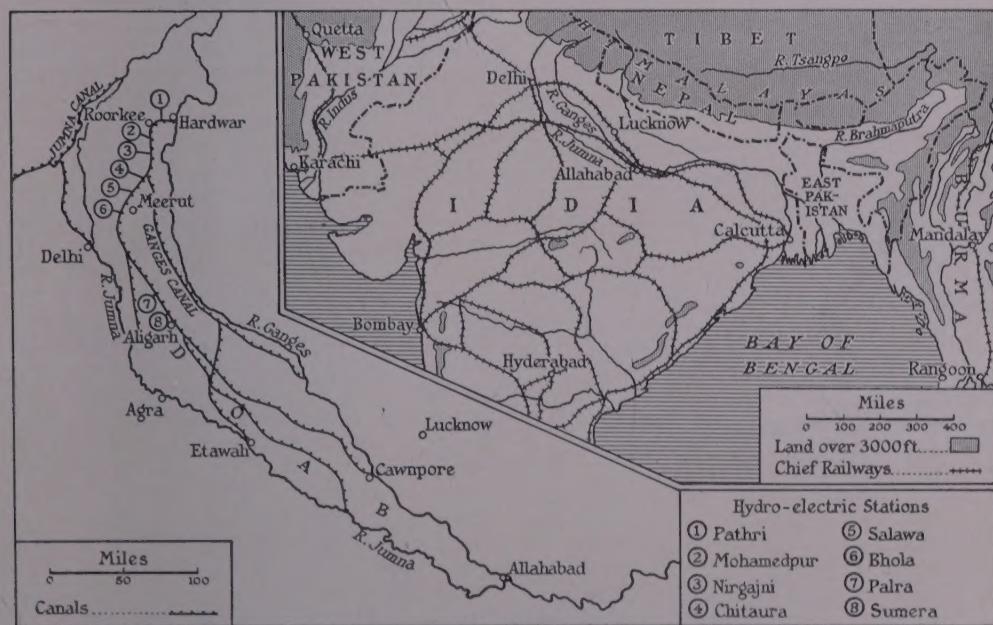
On Cautley's return, and with the removal of the administrative brakes, the work went ahead at full speed, accentuating the already massive problem of supplies. The greatest need was bricks, which were wanted in endless quantities for every structure on the canal.

There being no large kilns in the vicinity, the engineers had to enter the brick-making business themselves. They found that the absence of kilns in the area was for a very good reason—the lack of proper fuel.

The jungles for miles around were full of nothing but *Butea frondosa*, that gorgeous tree known as the "Flame of the Forest". Though, undoubtedly, one of the most beautiful flowering trees to be seen anywhere, it is the last one would choose for baking bricks: the wood catches fire like tinder and rapidly burns away. But the engineers had no choice.

It takes many pages in Cautley's memoirs to describe all the ideas they tried in the effort to utilize this fuel. Kilns were constructed to every local variation, and according to designs in the English and Dutch books available, but always a large portion of the bricks got burnt up. Finally, it was an army officer, just returned from a campaign in Sind, who solved the problem. In his kiln, based on those he had seen in the deserts of that distant province, the bricks were insulated with ashes and there were improved flues. It worked so well that Cautley writes: "Now we had bricks as good as any that could be had in Europe."

Figures show what the supply officers achieved. More than 300,000,000 bricks—enough to lay a row 50,000 miles in length—were delivered to the bricklayers, in addition to the countless millions that were broken up



for ballast, or powdered for the mortar.

To feed the fires in the kilns, a hundred square miles of jungle had to be chopped into firewood. The carriage of this required the daily use of 1500 to 2000 bullock-carts: all that could be hired or commandeered. The transport situation was so acute that Cautley even tried to borrow animals from the Army, but the attempt drew such a sharp rejoinder that Cautley hastily turned to less protected sources. "We have no carts to give", wrote back the indignant quartermaster, "but if our camels or elephants are so employed, there would be none among them with sound backs within a month. This objection holds good not only now, but for all time."

A hundred thousand tons of lime went into the mortar, the other main ingredient of which was *surkhi*; this, being nothing but powdered over-burnt brick, was never in short supply while the kiln experiments lasted! To reinforce it, things like jute fibres, ground-up lentils, gelatinous wild fruits and crude sugar were often added to the mortar. The last item created a problem which baffled even Cautley for some time, and there is an amusing anecdote about it.

Whenever lumps of this crude sugar, known as *gur*, were issued from the godowns it was found that scarcely half reached the mortar-pits, the rest being eaten on the way by the coolies and their friends. The severest threats had no effect, for the sweet tooth of the men proved always more irresistible. Nobody knew what to do about it, till one day the great Cautley had another of his brain-waves. Next morning he collected several of his assistants outside the warehouse, and as each happy labourer came out with his load of *gur* he was asked to put it down. And the startled man had to stand by while one by one the Englishmen spat upon it!

The headworks of the canal are at Hardwar, where the river enters the plains, after completing 180 miles of its tortuous course through the Himalayas. In its first fifteen miles the canal encounters most of the torrents which threatened its existence. These are collected into four streams and taken over the canal on super-passages. Then the land falls off sharply, to rise three miles later. It was to cross this giant hollow that the unprecedented aqueduct had to be built. This masonry-backed artificial channel is carried the whole distance on a 300-foot wide embankment, excepting where it crosses the furious Solani torrent on a masonry bridge nearly two furlongs in length. On the other side of the depression the canal enters the

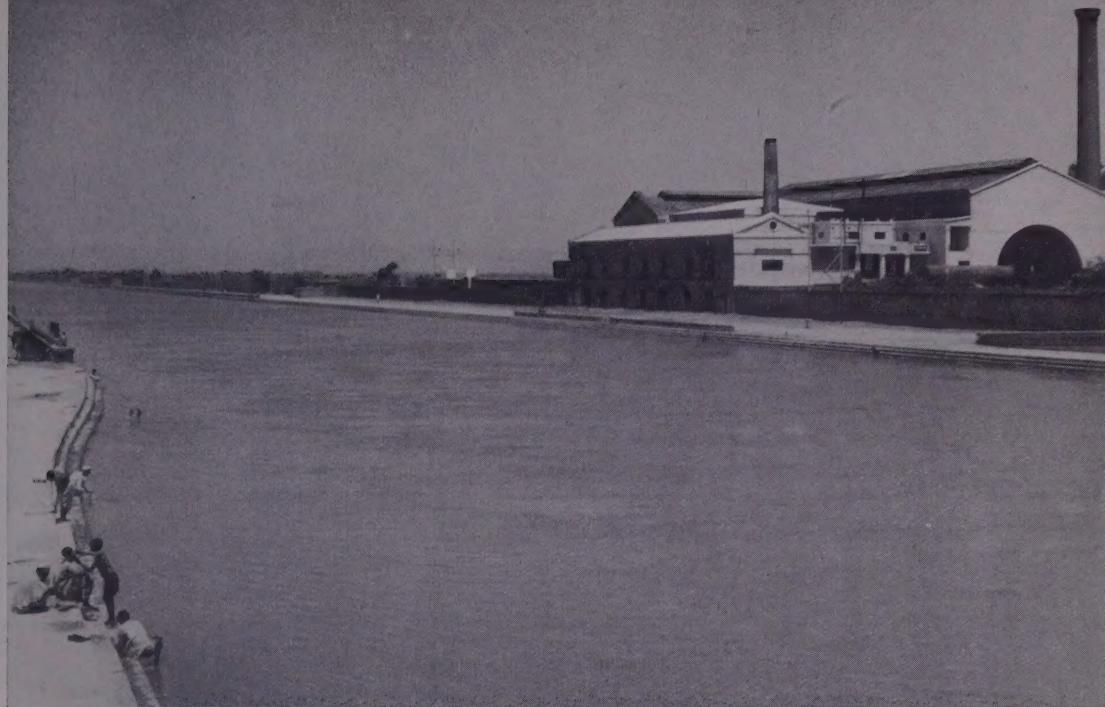
town of Roorkee, where the great Workshop and the Engineering College established by Cautley are still flourishing. Here, the level of the canal is eighty feet higher than that of the parent Ganges River, which flows almost parallel.

When work was first started, earth for the embankment was carried in basket-loads, but Cautley soon set about mechanizing operations. Rows of planks were laid inclining down from the high ground on both sides, and earth was trundled along them in imported wheelbarrows. Even this proved too strange for some of the workmen who, when first issued with the barrows, promptly lifted them onto their heads, taking them to be heavy-duty baskets!

The next step was the building of a rail-line, with rails forged in the local workshop, along which men, and later horses, moved wagons. This system worked well; but, as Cautley believed in keeping up to date, a steam-locomotive was ordered from England. It was received with ceremony and, when it pulled the first wagons on December 22, 1851, thousands shouted in wonder; but the triumph was short-lived. It began to go out of order more and more often, every time blocking the line to all traffic. As Cautley succinctly put it, it seemed to belong to the species of "machinery for exportation to the colonies". After several months, a merciful explosion in its boiler provided a valid reason to take it off the rails—the boiler can still be seen in the Roorkee workshop. Thus ended the career of the first railway-engine to work in India. Cautley never imported any more.

The excavation of the canal was done mainly by the Oades, a gipsy tribe who were professional diggers to much of North-West India. Though extremely poor, they were so carefree that Cautley found among them some of the happiest mortals he had met. They took great pride in their task and worked in a very organized manner. Lovers of solitude and open spaces, they refused to work on the lower part of the canal, where it passed through densely populated regions. Here the digging was in the hands of amateurs—villagers and agricultural labourers. They took so little interest in the work that a day's rain, or a fair nearby, was enough to disrupt the whole camp. Then the officer-in-charge would have to go on an extended tour of the villages to collect them again.

In spite of all these strange difficulties the canal was completed to schedule in 1854, water for irrigation being supplied from the spring of next year. The cost of the canal came

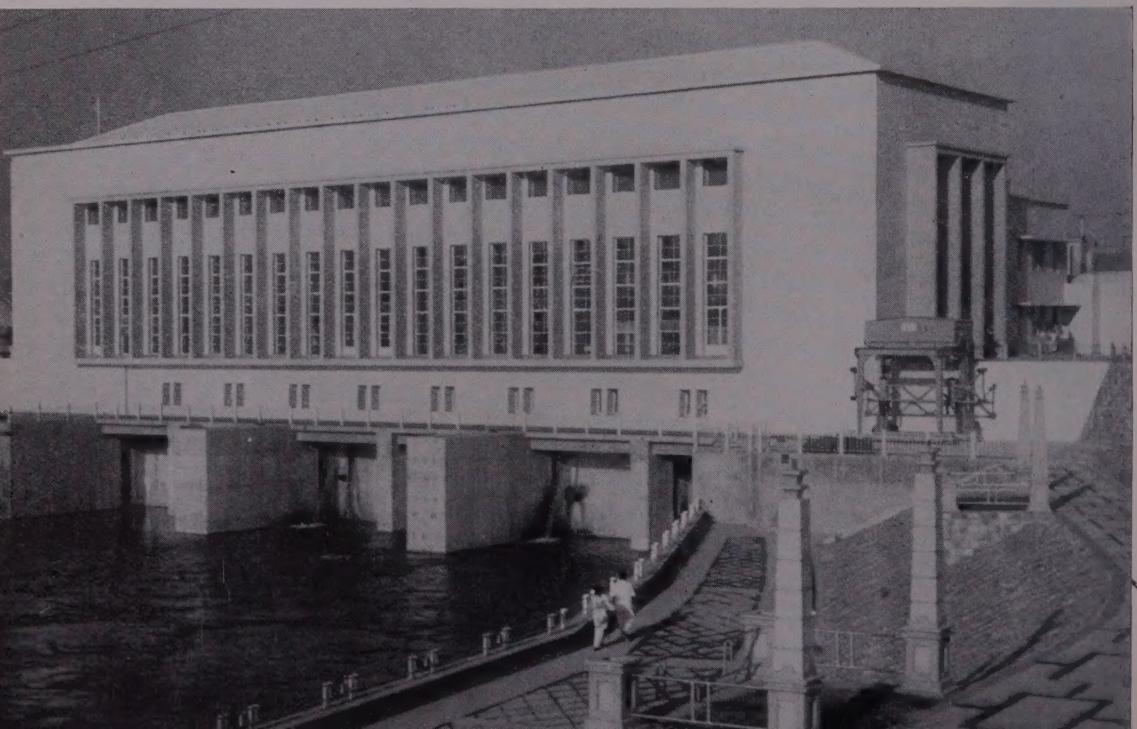


(Above) The building near Roorkee which housed Cautley's foundry and workshops during the construction of the Ganges Canal. (Below) Each winter the canal is dried out to clear boulders and silt from its bed. These men and mules recreate the scene of its construction over a hundred years ago





(Above) A hilltop view of the weir across the main stream of the Ganges and the new regulator, both of which were completed in 1920, thus greatly increasing the benefit from the canal. The Pathri Powerhouse (below), completed in 1956, is the eighth such installation to be harnessed to Cautley's canal



to fourteen millions of the Company's rupees, or £1,400,000 at the prevailing rate of exchange. It must be remembered that in those days three-pence a day was considered good pay for a labourer.

On this achievement Cautley became very famous. His bust was installed in the Calcutta Town Hall and, when his ship sailed, the guns of Fort William fired a salute. His luggage included 214 large chests filled with fossils from the Sivalik Hills, which he later presented to the British Museum. On arrival in England he was at once knighted and in 1858 was appointed to the Council of India. He died at Sydenham, near London, at the age of sixty-nine.

Even after Cautley the canal has an exciting history. Within three years of its completion came the Mutiny. As the waterway provided rapid transport for troops going to the storm-centres at Meerut and elsewhere, the Headworks at Hardwar became an important target for the rebels. When they made the attack there were hardly any soldiers at Hardwar and they would have succeeded but for the courage and ingenuity of Moola, an old canal employee. While the rebel troops were crossing the shallow river, Moola, on his own initiative, suddenly closed the canal gates. This sent the water surging back into the river, drowning six hundred men. The canal could protect itself.

Ever since it was built, there has been no year in which the canal has not progressed in some way. New branches were dug, the gradients straightened out, and the water-supply increased. The biggest step came in 1920 when a great weir was completed across the main river, enabling all the water available to be diverted into the canal. Today it irrigates 1,700,000 acres of sugar-cane, rice, oilseeds, and other crops, making the Doab one of India's richest agricultural regions.

In the 1930s, with the coming of motor transport, navigation on the canal declined. But even as modern technology outmoded the canal's tow-path, it made valuable a hitherto neglected part of it. The many falls that



*In 1954 the centenary of the opening of the Ganges Canal was celebrated. The President of India, Dr Rajendra Prasad, headed a boat procession symbolical of the one with which Cautley first opened the canal. The many-headed serpent on the President's boat is the legendary dweller of India's sacred rivers*

Cautley had provided to restrain the canal's slope became sources of power. One by one these were harnessed and by 1939 they were running the turbines in six hydro-electric plants. Then the war intervened. The Pathri Powerhouse project, which utilizes the four remaining falls, was taken up in the First Five-Year Plan. With its completion last year the canal has reached the climax of its usefulness: the development begun by Cautley may be said to be fulfilled. It is a commentary on the times that, in terms of money, this one powerhouse cost more than twice as much as did the entire canal originally.

As yet there is no formal memorial to Cautley in India—but what memorial could be as magnificent as the canal itself? So long as that lasts Cautley cannot be forgotten. It would seem that Cautley kept this specifically in mind when building all his structures: they are so strong that the Public Works Department has today to pay five times normal rates if any of them need to be demolished. . .

# India: Unity in Diversity

by FRANCIS WATSON, O.B.E.

*Mr Watson here reviews the constituent elements of that idea of India to which it is the task of the present generation of Indians to give both shape and reality. In a preceding article, published in our July number, he described the varying moods of the 300-year-old 'affair', not yet at an end, between Britain and India. His book on Gandhi—based on a remarkable series of broadcasts which he prepared for the B.B.C.—is being published this autumn in Calcutta by Orient Longmans*

THE "colours and costumes and myriadism" which stunned Edward Lear with delight when he reached Bombay in 1873 are India's perpetual, indescribable attraction. Travel and pilgrimage are as old as India. Tourism is relatively new, and the first two items in the national treasury are of course the Taj Mahal at Agra and the Ajanta Caves near Aurangabad—neither of them Hindu yet both saying with the clearest voice "India". The Taj Mahal may have Persian affinities and even, as is often said, Italian workmanship. Nevertheless it is simply the most famous among many stupendous monuments of that Indo-Islamic fusion, the Moghul genius, for whose works nothing outside the sub-continent could be mistaken. Ajanta announces, first, that India has a primacy measured in millennia in arts once represented as Europe's exclusive glory; secondly, that a brilliant civilization could be paradoxically inspired by a religion of renunciation; thirdly, that the Buddhism which India eventually rejected as an institution could yet become, in a curious and contemporary sense, the headstone of the corner; and, fourthly, that the colours and costumes and myriadism come from India's very roots.

A diversified culture, as represented by large things to look at, is the impression which India today is content and anxious to make. A new jungle-airstrip may give access to a mediaeval Hindu temple which was not long ago the almost private pleasure of the rough traveller; but the foreign visitor will be urged not to overlook the great mosque at Delhi, the Golden Temple of the Sikhs at Amritsar, the 56-foot Jain colossus of Gomateshwara in Mysore State, the shrine of St Thomas near Madras which hallows a Christian tradition older than that of Canterbury. All this is India—and so, we shall be assured, are the buildings of Lutyens at New Delhi and of Le Corbusier at Chandigarh. But there are new temples, of a new cosmopolitanism: the great dams that have for the Prime Minister, as he would like them

to have for the millions, a near-religious meaning (and if the life-giving rivers are sacred, why not?). On the list for tourists—especially, but not only, for official tourists—are the multi-purpose projects, the steel-works, the fertilizer factories, the research-laboratories. This is the new materialist culture that transcends frontiers and evens out distinctions, but the instinct to put an Indian stamp upon it all is powerful, groping among the ideologies for its own expression.

There is a celebrated Vedantist approach to spiritual truth which answers the enquirer: "Not this, not that." It might serve in some fashion as a text for political and economic neutralism. But any discussion of the difference, the competition in principle, between development projects in India and, say, in China will search at some point for the positive and find it not in structures but in people. Unity in diversity is in India an immemorial theory of the nature of man, not a sudden discovery for the expedite of organizers. Mahatma Gandhi, who dropped the fact of Indian poverty into political parlours with an explosive thud, never talked of "the masses": he invoked "the poor man". The new word in contemporary Indian political philosophy is "humanism", with a small "h". The important recognition is that diversity has a *right* to temper unity.

There is perhaps no habit of unperfected man which more offends the prophets of a statistical paradise than his addiction to holidays, fairs, religious festivals, and the propitiation or celebration of the rhythms of Nature. Back, then, to our tourist literature, which offers thirty "All-India" festivals throughout the year, with innumerable regional variations and additions. You can choose, for spectacle, between a water-carnival under the lake-hung ramparts of the palace at Udaipur, a splendid elephant-procession through the streets of Mysore at Dusserah, or ten whole days at Brindaban, Krishna's legendary birthplace near Mathura, for the festival of the chariots. At Mehrauli,

in the Delhi district, you can attend a Christian *mela* (fair) as the days are warming up in March, or a festival of fans, flowers and fire-dancers in which Hindus join with Muslims when the rains are over in September. You can mark the seasons in different climates and for different crops, as in Chamba, in the Himalayas, where the year's last dance and procession are the more joyous for the knowledge of ice-bound months ahead; or deep in the green beauty of Malabar, where fireworks, feasting and Kathakali dancing celebrate a tropical harvest.

But the myriadism does not wait to be collected in a careful itinerary. The colour and diversity impress themselves at once, in the unidentified figures squatting beside the cannas in the compound of your Western-style hotel, in the mixed millinery of the tram-queue before ever you explore the fly-blown glory of the bazaar. The span which must be taken in is suggested in the cliché of the peasant behind his bullocks looking up at the passing air-liner. But it is wider than that. At one extreme is the Nobel prizeman at work on nuclear research or cosmic rays; at the other is a man who has not yet used a plough or a bullock, who burns the forest and sows seed in the ashes, whose aboriginal Nature-worship has not been overtaken by 3000 years of Brahmanism.

The span has widened, indeed, in the past generation. There is the great extension of the new managerial class which mixes the cultures of East and West to taste and as required. Insofar as it is the product of educational policy it stands to be re-moulded in the future; but educational policy itself is less rigidly decisive, more subject to local and even individual pressures, than might appear in brief statements about, for example, the place of English in the curriculum. If this is a new national nucleus in the making, the oldest of all has for several reasons come newly into the picture. It is the item of 25,000,000 tribal people, a richly diverse world of its own. Protected and often unadministered under the former dispensation, their isolation preserved, these scattered groups of forest-dwellers hardly appeared to be part of "the problem". Now they find themselves at one jump members of the world's largest democracy, and in danger of invasion by planning and by prohibition. In the North-East, which suddenly became India's threatened frontier in World War II and is today an important defence-area centrally administered, a special Agency has

been established to deal with tribal affairs, as described by Dr Verrier Elwin in the December 1946, number of this magazine. In other regions, no less remote, dam-construction or forest-reclamation threatens all wild life, human and animal. There is nothing wanton about this. The prospective consequences are painstakingly studied, and if missionaries are not in favour anthropologists are both employed and respected. A Backward Classes Commission produced an exhaustive report, which by considering all "depressed", "underprivileged" and formerly so-called "criminal" classes along with the untouched tribal people, introduces into the vast and variegated pattern, for good or ill, the idea of fluidity. Degrees of civilization are what astound the observer. Degrees of the privilege of living are what the planners, if they could, would abolish. This is not the same thing as ignoring differences.

With all this to explore, why go to New Delhi? Of course it is not the country. Few capitals are, and New Delhi is in any case the capital of a federation now reorganized as fourteen states and six territories. It is hundreds of miles from the main business centres and it has no industrial hinterland. It is there because the British planted it there among the crumbling monuments of dynasty after dynasty that had grasped at dominion where the last low outcrop of the Deccan hills meets the Gangetic river-system. But today the government that sits there (with a clerical population said to be increased six-fold since independence) has the new responsibilities of social democracy; and it commands communications and administrative techniques which have brought fresh factors into the age-old Indian tussle between centrifugal and centripetal forces. (There is something appropriate in the fate that chose New Delhi as the scene of the martyrdom of Gandhi, who distrusted centralized power and held that the least government is the best.) It was in New Delhi that the theme of unity in diversity was elaborated in possibly the longest constitution ever written. Here, today, is the point of tension.

Here also, on each Republic Day (not in August, but in the cooler time of January), the immense processional way, which for twenty years awaited the great occasions for which it was laid out and the crowds that never came, is the scene of a procession—a deliberate exhibition of India to herself and to others. The first hour of the parade is martial. A Gandhian President in homespun cap is saluted at one moment by the

erie antennae of a mobile radar unit, at another by the Jaisalmer camel-troops upon their disdainful, cream-clean steeds. The apparatus of scientific war growls past as a token to the taxpayer. But the old, superb *panache* is there too, the pennanted lances, the brilliant uniforms, the cavalry like centaurs, the faultless styling of beard and turban, the picturesque variety of feature and accoutrement. And the magic of pipes and drums and fifes beats up, with no interruption, out of the heroic past which was the pride of another nation.

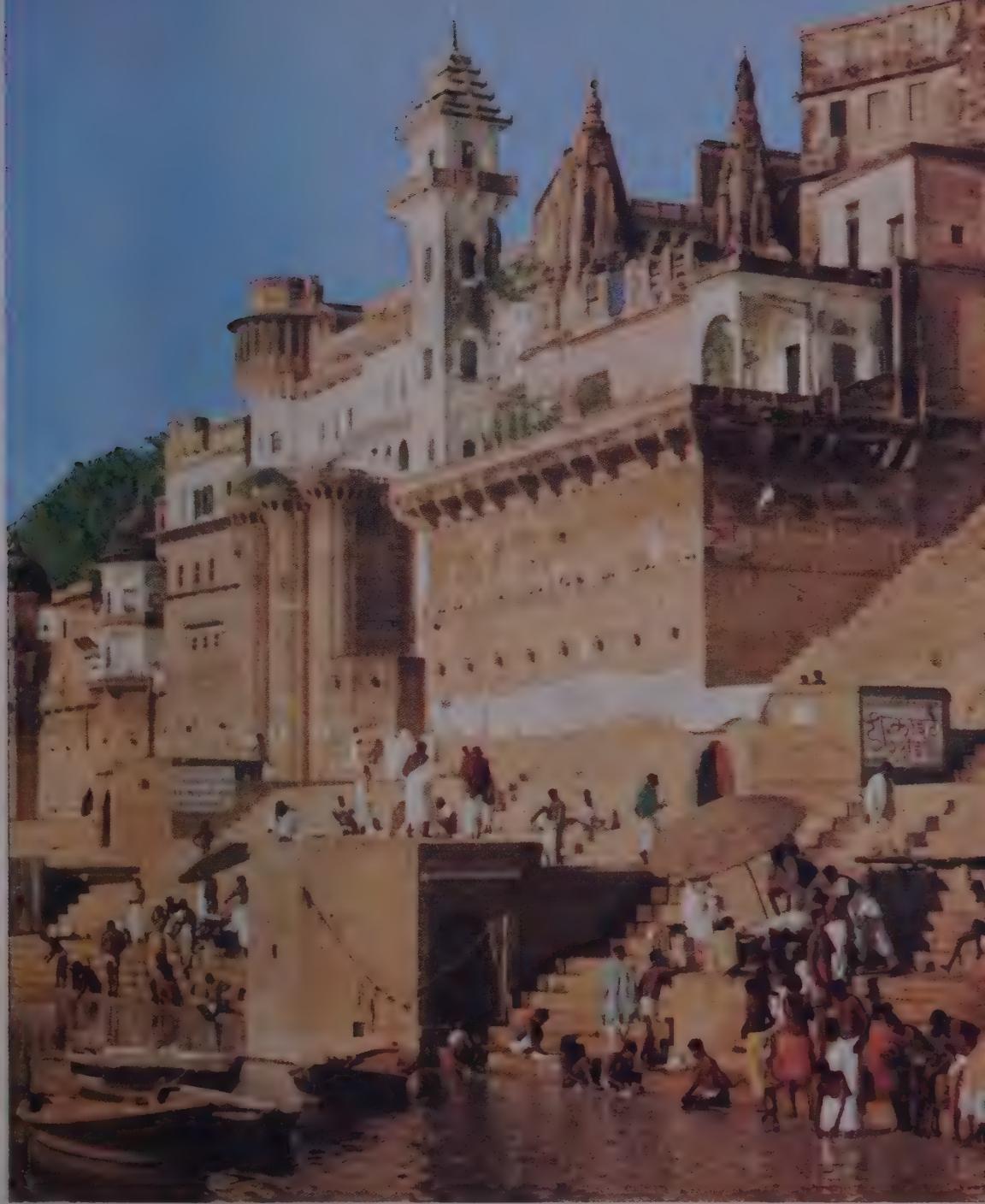
There is in truth a sense of empire which Indians can feel while condemning imperialism. It is an emperor's emblem—the lion-capital of Asoka—which they have adopted. The geography and the history of India are large enough in themselves to contain the theme which has such colour for the spectator of our own imperial occasions. To a citizen of Kerala in the deep south the chivalry of Rajasthan and the stocky riflemen of Garwhal may be as exotic, and as possessively gratifying, as they ever were to a Cockney; and when Madrassi units were flown into Kashmir in 1947, many of them were seeing snow for the first time in their lives. There is little for surprise in the attachment shown both in India and in Pakistan to the traditions of the old Indian Army, for the soldier's code meant at least as much to Indian officers and men as to the British. The British military organization, partly reflecting its own conventions of regimental loyalty and partly for obvious expediency, honourably preserved the individuality of clan and region, and was sometimes thought to be excessively tender towards religious and caste differences. The forces of the major Princely States added their own separate self-assertions. The new map of 'integrated' India has not wiped out these differences, but the army is the only one of the defence services that can give them expression. How long they can withstand the functional groupings of a modern defence-machine is another question; but for the present even those Indians who harbour misgivings of conscience about the bombers in the fly-past can be mildly appreciative of the symbols of a variegated national glory.

They can relax, moreover, when the panoply of war has passed on and two placid elephants herald an hour or so of 'culture'—that is to say, of lorry-borne tableaux from the different States of the Union, of striding, skipping and singing schoolchildren in regional costumes, and of folk-dancers who

break up the marching rhythm at their own gay will. The fun and the spontaneity that invade the ceremonial, the give-and-take with local supporters in the crowd, are infectiously Indian. But the official contrivance of the whole show is Indian also. The drive comes from the Centre. The States, which have their own elected legislatures vested with certain powers, can remind the mushroom metropolis on Republic Day of their great and competitive diversity. But they also get directives to remind them in their turn that India as a whole is in the critical throes of development and that what matters—even in a processional float—is the contribution of each region to meet the challenge of the hour. Some of them take this responsibility very seriously. Others cannot be wooed from the blazoning of a local saint or mediæval poet. The result, happily enough, has more of Lord Mayor's Day in London than of May Day in Moscow.

The dancers can be seen at full stretch in the National Folk-Dance Festival which is now an annual feature of the celebrations. One fancies a parallel with the Sokol gymnastic movement which was once used to express the new and hopeful nationhood of Czechoslovakia. But the Sokol stressed the unison of mass exercises, a thousand white-clad figures moving together. The discovery of India's folk-dances, as of her tribal people themselves, is the enlargement of an already bewildering diversity. One motive is to give the assembled rural teams a conducted view of what government is and where it lives—Gandhi once spoke of villagers whose sole notion of politics was that "some god rules over us". Another is to bring the countryside to the eye of the townsman, and perhaps above all of the bureaucrat, thus continuing the task which was central to the national revolution and now has to meet the accelerated urbanization of the last decade. In a nation concerned with large-scale development, a nation that must run, as Mr Nehru has said, before it can walk, isolation exists to be broken down.

But isolation is not always what it seems. India is a land seething with "otherness" and yet the *recognition* of other people, of the unity underlying human diversity, is fundamental even within the limited experience of the village. Closely-knit families, communities and castes may be mutually exclusive, but they accept each other; caste itself, while dividing men according to their functions in society, rests at least on the theory that those functions are interdependent. Fundamental as



B. R. Gooroo

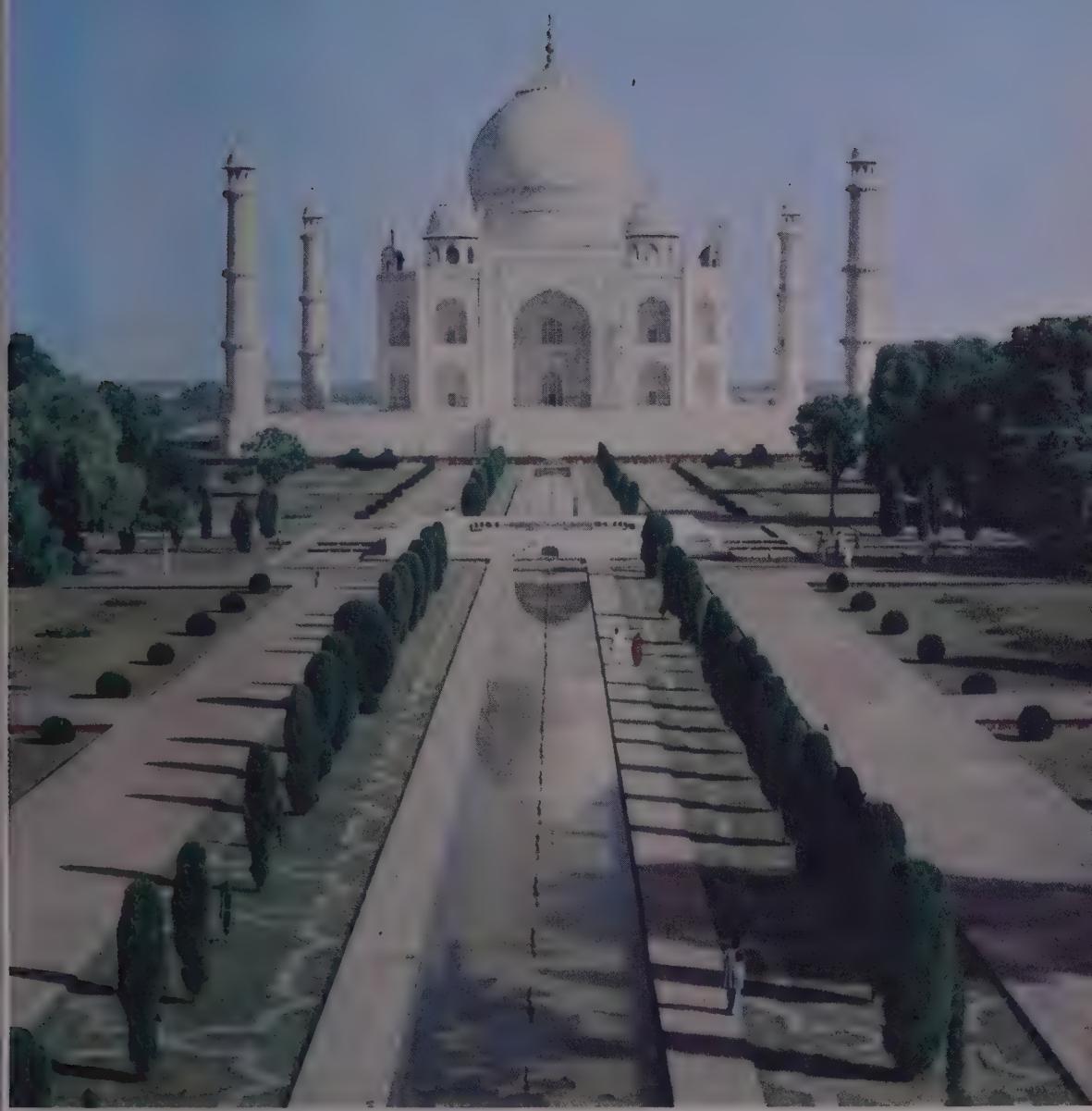
*In Benares, at home with diversity for 3000 years, nobody stares at a stranger, and the stranger may stare at will. Here, where the sacred Ganges bends north, the proliferation of cult and custom among the ritual bathers has exhibited an underlying unity since Aryan settlers intoned the first Vedic hymns*



anavali

A. Costa





Camera

(Above) The Taj Mahal at Agra was built for the Moghul Emperor Shah Jahan, who had a Rajput mother and a half-Moghul, half-Rajput father; and Indians of all faiths treasure this matchless garden-tomb as a costly memorial of romantic love rather than of an alien dynasty. Shah Jahan also built India's greatest mosque, the Jama Masjid (opposite, top) in his city of Delhi, with corner-pavilions as 'Indian' as the domes and minarets are 'Persian'. Neither the unifying experiment of Akbar and his immediate successors, nor the image-breaking Muslim invasions, touched the deep South, which retains its tropical Hindu 'otherness': its own language-groups, dress, traditions and caste-problems; and its own temple-architecture of which Madura (opposite, bottom) is characteristic, with its open courts and tanks and wedge-shaped gate-towers in which grandeur of form dominates elaborate sculptural decoration



Top: photographs by G. C. Dorsett



(Opposite, top) *Progressive and cosmopolitan Bombay, with modern blocks and modern cars on its Marine Drive, offers challenging standards for the development of India, while the sadhu (opposite, bottom) cooking his meal in a Delhi street silently questions the whole aim of material progress. Even if many of India's holy mendicants (of whom there may be 3,000,000) are frauds, they are tolerated because the view of life that produced them is respected, and the man in the limousine may still conceivably pass his last days in voluntary retirement in a cave or forest. Thus, though large-scale economic and social planning has come to stay, consideration of the nature of the good life and the price of material advance remains an Indian preoccupation, colouring attitudes on home and foreign affairs*

*Mrs G. Mehta*



*G. G. D. - 10*



(Above) *Classical Indian beauty: two sisters demonstrate the revived interest in the dance—in this case a Manipuri dance of the kind popularized by Rabindranath Tagore, pioneer of a new cultural synthesis among the upper classes. The Manipuri school has been sophisticated from the folk-dance of the mountainous North-East, beyond the Brahmaputra, an important defence-area which is also the home of tribesmen such as (left) the Wancho Nagas. The Nagas of the Assam hills are splendid and still warlike primitives among India's infinitely varied population of 25,000,000 tribal people who now find themselves—before some of them have learned the use of the plough—"at one jump members of the world's largest democracy"*



R. C. Green



The great variety of scenery in India is never without character. South of the alluvial Indo-Gangetic plains stretches the vast peninsular plateau, sloping gradually eastwards from the high coastal ranges which break the south-west monsoon but leave much of the Deccan in "rain-shadow". Reddish-brown is the memorable colour, the green brief and seasonal, but among the flat-topped hills there are valleys of peculiar charm, and in the Western Ghats, in hill-stations like (above) Panchgani, terrace-cultivation looks out upon wide horizons. Farther south Mysore and Travancore (in the newly formed State of Kerala) have areas of virgin jungle with abundant wild life. (Left) Working elephants being bathed in the Mysore forests are captured in the khedda operation once patronized by Viceroys

*The foothills of the gigantic Himalayas rise abruptly from the northern plains of India and Pakistan along an arc of fifteen hundred miles, taking the traveller or pilgrim first to an almost continuous line of high, enclosed valleys reached along river-beds. Sonemarg, here seen, lies at the head of the Jhelum valley in Kashmir. The different peoples of the Himalayas, though racially distinct from the plainsmen, have largely adopted religious cultures—Hindu, Buddhist or Muslim—moving upward against the flow of the sacred rivers*

*G. C. Dorsett*





Dorsett

*Fishermen in a peaceful landscape of Kerala, towards the tip of the Indian peninsula. The long coastline has few natural harbours and the dense population of the South-West lives not in cities but in villages that seem almost continuous. The fishery is inshore, and the coconut-palm is the "tree of wealth", its fibre (coir) providing the main cottage-industry. The beauty of scene and people in this region is proverbial*

such acceptances in Indian life have been, it may take a revolution to recall a nation to its fundamentals.

The otherness of religion has produced, in the special circumstances of political history, a profound psychological shock. The militant attitude of right-wing Hindu parties towards Islam and Pakistan is something which progressive government knows it has to counter and ought in time to render ineffective. Less militant certainly, but in some ways more intractable, is the widespread feeling that Partition, even though expedient, offended some natural and therefore eternal law. If that be so, the most that Indian statesmanship is entitled to expect is that at some future time the law will reassert itself in a new configuration that will offend nobody's separatism. In the meantime the very retention of the name "India" remains, one must own, a symbol on one side of the frontier and an irritant on the other. But on both sides Partition made both the risks and the temptations of further subdivision more apparent. The word "fissiparous" has been so much used as almost to be an Indian rather than an English adjective. Yet indeed there is a further lesson: had more been conceded, and earlier, to Muslim aspirations, might not the utmost have been avoided?

One answer to the "fissiparous" original sin is the principle of the secular state, in which all religions are recognized and protected but none is established. But the secular state is not so secular as to ignore what it rests upon, which is the sanction of a *territorial* religion. It is not race that makes a Hindu, but in one important sense it has always been geography rather than confession. The 8,000,000 Christians, the 6,000,000 Sikhs, the tiny but active minority of 100,000 Parsis, exist not alone by the tenacity of their differences but by the extent of their merger in Indian life. As for the 35,000,000 Muslims who remain in India, they alone would provide an overriding justification for the secular state—which, it should perhaps be added, is fundamentally different from the atheistic totalitarian state.

India by intention is also to be "a classless and casteless society"—which, looking back, is a sufficiently startling declaration. One force which is working, if slowly, against caste is the reformist element within Hindu religion and society, greatly strengthened because Mahatma Gandhi chose to meet the orthodox on their own ground. Another is the pressure of material change and progress, the "westernization" or more properly "moderniza-

tion" of the business of getting and spending. These two sets of forces are by their own nature mutually hostile. Yet by the Indian nature, so apt in reconciling contrasts, they may be harnessed to the same end. But the "otherness" of class, what exactly does that mean? Nobody (except a Marxist) is sure that he knows. The princely aristocracy was dispossessed by an act of organizational efficiency working upon historic fact, but the effect in the field of loyalties—the life of feudalism—could not be foreseen and is not yet to be assessed. The inevitable land-reform has been given by Vinoba Bhave's extraordinary "land-gift" campaign: a dynamic which, whatever else one may say of it, is exclusively Indian.

Finally the work of integration, the establishment of unity in diversity, has had to come to grips with the impulse in a multilingual state to divide according to language. It seems a more reasonable line of fission than any other. But both the pull and the resistance, as well as the "Indian-ness" of the whole problem, are suggested by the fact that the central government policy was originally reversed by the death of one man in a fast of protest.

What has happened to the map of the new India is a gigantic tidying-up. Every great nationalist, including Gandhi, has recognized the structure of unity as a legacy of the British *raj*. But the structure, having been imposed from without, was in many respects artificial, and perhaps none the less remarkable for that. The task is to remould it, without shattering it to bits, nearer to the heart's desire. There are many hearts, and many desires, and the deep unity so instinctively felt is often an elusive quality. This was well expressed by a distinguished lady, member of a family which has served both India and Pakistan in prison and at the council-table. In a room as simple as any ashram in the midst of New Delhi's luxurious expansion she sat bubbling with talk upon her string cot, and all at once became a Cassandra. "We do not know what we are," she said, "so how can we know what we are to become?"

It is not without point that Mr Nehru's record of history and experience, written in prison, was called *The Discovery of India*. India's own search for herself is an unfinished adventure. But among the competing images there is one that has been rejected. We shall no longer be able to quote:

"She watched the legions thunder past,  
And plunged in thought again."

# The Story of the Survey of India

by Brigadier G. F. HEANEY, C.B.E.

*Of the many bequests comprised in the British legacy to India and Pakistan which are freely recognized by the inhabitants of both countries, perhaps the most basic is a geographical one: the accurate mapping of the whole sub-continent. Brigadier Heaney joined the Survey of India in 1921 and was Surveyor General of India from 1946 to 1951. He wishes to acknowledge his debt to the Historical Records of the Survey of India by Colonel R. H. Phillimore, C.I.E., D.S.O., of which the Survey of India, Dehra Dun, has published the first three volumes*

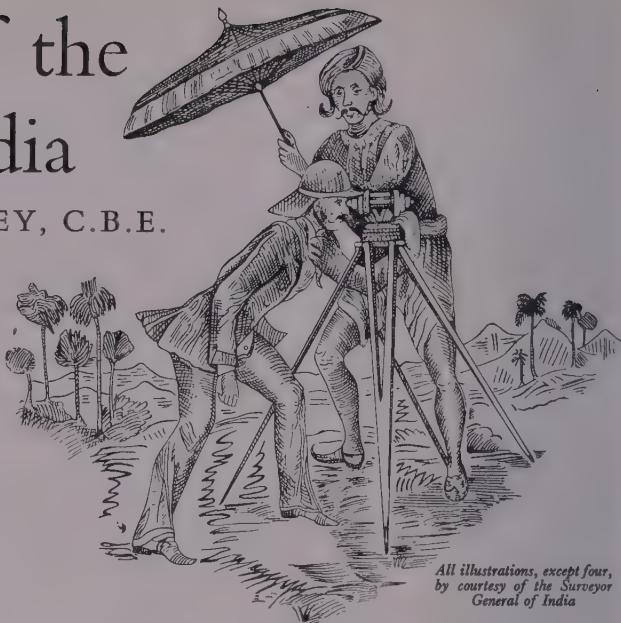
They sends us along where the roads are,  
but mostly we goes where they ain't  
Kipling

ONE hundred and ninety years ago, ten years after the battle of Plassey had established the East India Company's rule in Bengal, Clive the Governor appointed James Rennell, a twenty-four-year-old army officer, then engaged on survey work, to be Surveyor General of the Company's possessions in eastern India.

Today, ten years after the end of British rule, we find the Survey of India, which traces its descent directly from Rennell's appointment, larger than ever and manned entirely by Indians, playing an increasingly important role in the development of modern India.

How did all this come about? In the course of a short article I can do no more than sketch the story in the briefest outline, and indicate by incidents from the lives of those who served it the spirit which for nearly two centuries has inspired the Department and led to its achievements.

Land-surveying had been practised in India long before the coming of the European. It had, however, been applied to the measurement of distances along main routes and of the areas of comparatively small plots of village lands and the like for tax-assessment. Maps of large areas drawn to scale formed no



*All illustrations, except four,  
by courtesy of the Surveyor  
General of India*

*A surveyor at work, wearing his uniform: from the Manual of Surveying, 1855. Uniform is no longer worn, except on active service, by army officers in the Survey of India while working*

part of the indigenous system of surveying. Before Rennell's time, though the coastline of India had been roughly charted from ships, the interior was geographically virtually unknown. Rennell's task was thus to create a map where none had existed before.

To do this he developed a system of route-surveys following main lines of communication. Distances were measured by perambulator, a large wheel fitted with a device for counting revolutions and directions by magnetic compass. Geographical position was checked by astronomical observation.

We get a vivid impression of Rennell at this time in a letter written early in 1767 by Clive to his Court of Directors in London. "We have appointed Captain Rennell, a young man of distinguished merit in this branch, Surveyor General and directed him to form a general chart . . . This though attended with great labour does not prevent him from prosecuting his own surveys, the fatigue of which with the desperate wounds he has lately received in one of them, have already left him but a shattered constitution."

In spite of constant sickness, in those days inseparable from field work in Bengal, Rennell carried on for ten more years, when he was obliged to retire through ill health. His

interest in his work, however, remained undiminished and he devoted the rest of his long life to the furtherance of geographical knowledge. A writer in the 19th century has paid a worthy tribute to this great man. "Among his eager fortune-seeking countrymen in Bengal, Rennell stands forth as a unique figure—a calm disinterested man of science. All the honours of science he reaped. For other distinction he cared nothing." Rennell's work in India was finished, he had pointed the way and others were eager and ready to go forward.

These early surveyors were largely army officers and the number of those who died of sickness contracted on their work appals the modern reader. Too often an assignment to survey in the jungles was virtually a sentence of death. As late as the 1840s, of five officers employed in observing a series of triangulation along the foothills of the Himalayas two died and two had to be retired from service through ill health. Their assistants and the humble survey *khalasis* (unskilled labourers) who carried their instruments suffered in like proportion.

At the beginning of the 19th century another figure dominates the survey scene. William Lambton was an officer of the 33rd Foot Regiment who realized that the only satisfactory basis for surveys in India would be a series of points with their positions fixed by a framework of triangulation of the very highest precision, which could also be used for computing a more accurate figure for the size and shape of the earth. Lambton's Great Trigonometrical Survey (as it was later called) was for those days a vast scientific dream, which offered few immediate financial advantages; and it says much for the foresight of the East India Company that funds were always available to carry it on.

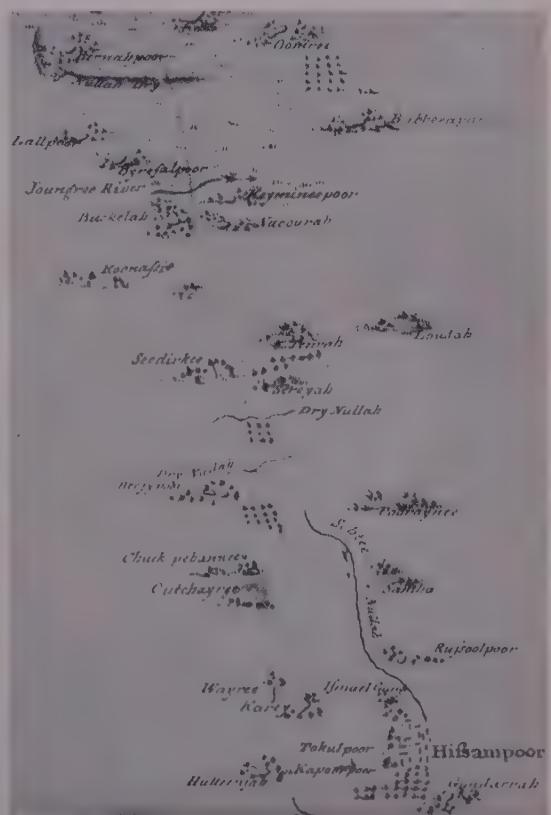
Lambton was equipped with a theodolite of the latest design. This enormous instrument, with a graduated horizontal circle of three feet in diameter, weighed over 1000 lbs when packed for moving. In 1801 after measuring a base line near Madras he began his triangulation. He was then in his late forties and he dedicated the rest of his life to his work. Twenty-two years later he died in the field. By then his triangulation had covered the whole of southern India and was being extended northwards through the Central Provinces.

George Everest, his successor, has given us two vivid glimpses of Lambton. The first is in 1808 when he was at the height of his

powers. His great theodolite was being hoisted to the top of a building when one of the guy-ropes broke and the instrument crashed against a wall. To all appearances it was wrecked beyond hope. Lambton, however, shut himself up in his tent for six weeks, admitting nobody but his head artificers, and repaired the theodolite with his own hands. The second is in 1817; he was then an old and sick man, and was instructing Everest in field observations. The latter describes Lambton as "this great and extraordinary man" and adds: "When he aroused himself for the purpose of adjusting the great theodolite, he seemed like Ulysses shaking off his rags; his native energy appeared to rise superior to all infirmities, his eye shone with the lustre, his limbs moved with the vigour of full manhood."

Lambton's work was carried on and extended though with modifications by his two brilliant successors, Everest and Waugh; and it is a fitting tribute to the former that the

*A Military Route, surveyed by Thomas Wood, 1799. James Rennell's first maps of India were composed of similar route-surveys pieced together*





*James Rennell (1742-1830) : Surveyor General of Bengal, 1767-77. For his pioneer work he became known as "the father of Indian geography"*

world's highest mountain, which was discovered during trigonometrical survey operations, should be named after him. By the end of the 19th century the Great Trigonometrical Survey had been extended to cover the whole of India and Burma. Lambton's dream of a century earlier had been more than fulfilled.

By the early years of the 19th century stable political conditions had been established over much of India and this led to an increased demand for maps for civil administration. Previously maps had been kept as secret documents, the few copies distributed being made laboriously by hand. Now security restrictions were relaxed and with the introduction of lithographic printing a revolution occurred in map-reproduction. The early lithographers brought out to Calcutta suffered heavily and it is recorded that of the first few all died from "mental disappointment" and disease. Their work, however, survived them and with the passing of years the volume of map-reproduction increased enormously, until during World War II millions of maps were printed yearly by the Survey of India for the armies and air forces of the Allies in South-East

Asia and the Middle East.

We have noted how, before the coming of the European, land-surveying had been practised in India for measuring fields and it was on revenue surveys in the 1820s that Indians were first employed as surveyors. From then onwards the technical grades were manned more and more by Indians who in the course of time were promoted and recruited increasingly into the officer classes. It was, however, with their skill with the planetable in topographical surveying that Indians were to make their most notable contribution to the work of the Survey of India.

The planetable came into general use about this time. It was simple, sturdy and inexpensive; and in these characteristics resembled the planetabler himself. He was generally a man of little education, selected for his aptitude, reliability and good physique. As planetable surveying became the most important activity of the Survey of India for many years, some description of a planetabler's life and way of work is necessary in any account of the Department.

The climate of India divides the survey year naturally into two seasons—the field season from about November until April and the recess season for the rest of the year. During recess, surveys carried out in the previous field season are fair-drawn for publication as maps, observations are computed out and arrangements made for the next season's work.

Shortly after the end of the rains field work begins. Planetablers are organized into camps of eight or ten, each under a junior officer; and we will follow one of them as he moves off from his camp headquarters to begin his work. Shomsher Rai is a planetabler in his early thirties; it is his tenth field season and he is now approaching the height of his powers. Accompanied by his squad of *khalasis* and two bullock-carts carrying tents and equipment he sets out on foot from his camp headquarters to his area of work which may be several days' march away.

The morning after arrival he is out shortly after dawn and accompanied by his *khalasis* makes his way across country to a small rocky hill on top of which is situated the triangulation station from which he is to start work. Arrived at the top Shomsher Rai sets up his planetable, a *khalasi* opens a large umbrella on a long pole and holds it so as to shade it from the sun's glare, and Shomsher Rai gets to work on his survey. He notes with satisfaction that the country

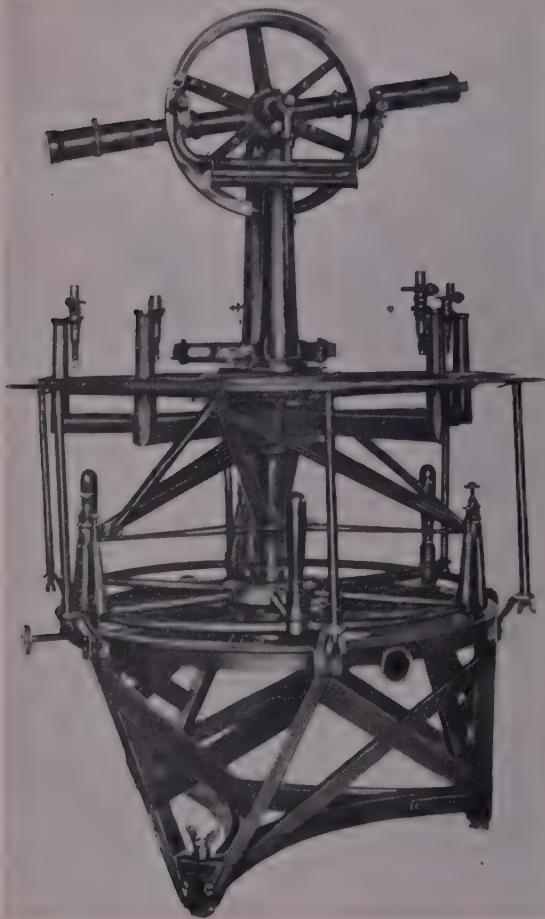


Bengal: (above) from D'Anville's Carte de l'Inde, 1752, and (below) from Rennell's Map of Hindoostan, 1782. D'Anville's map of India, the most up-to-date until Rennell published his work, still shows an imaginary river Ganga flowing into the Bay of Bengal. Early geographers did not realize that the Ganges of the Greeks and Romans and the Ganga of Hindu sacred writings were the same river

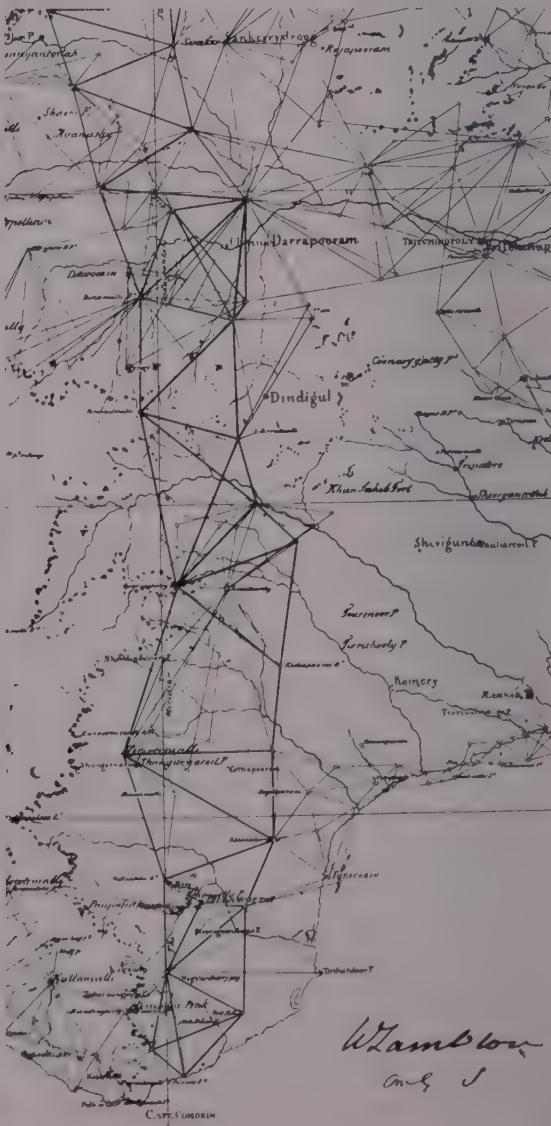




By courtesy of the Royal Asiatic Society



(Left) William Lambton (1756-1823), an officer in the 33rd Foot Regiment, began a trigonometrical survey covering southern India in 1801. (Below, left) His great theodolite, then the latest design, was captured by the French on the way to India and returned by them with a polite note to the Governor of Madras. It continued in use for many years and now has an honoured place in the Survey of India Museum. (Below, right) Part of Lambton's general survey, reproduced from his Plan of the Southern Provinces, which he completed in 1811. The heavy lines indicate principal triangulation



is open and that there are low hills from which he will obtain good views. The country is, to use a survey term, good "sketching" country and should enable him to reach an output of thirty to forty square miles a month on the scale of one inch to a mile.

For the next six months Shomsher Rai will be working an average of about ten hours a day. Every seventh day he will observe as a day of rest to bring his records up to date and give his *khalasis* an opportunity to wash their clothes. He will have no time at all for social life: he may not even speak the same language as the villagers in his area. He is a man dedicated to his work and the more we see of him and his fellow-surveyors the greater becomes our respect and affection for them as a class.

Sometimes the surveyor finds himself in the role of diplomat, and his safety may depend on his ability to gain the confidence of suspicious or hostile tribesmen.

Not long after World War I surveyor Chiragh Shah was ordered to survey part of unadministered tribal territory on the North-West Frontier, after the local political officer had been given assurances that he would not

be molested. The Pathan tribesman is, however, unpredictable; and the night after his arrival his camp was fired at. Chiragh Shah reported the incident and it was arranged for a flight of R.A.F. planes to fly low over the area to reassure him. When the planes arrived over his camp they saw Chiragh Shah's survey umbrella set up on top of a nearby hill. He was at work as usual. A few days later his camp officer received an urgent message asking him to prevent the political officer from taking any action against the tribe for their breach of faith. He explained that such action would be most embarrassing for him as he was now living as a guest in the house of the village headman who was responsible for shooting up his camp.

During World War II it became necessary to send detachments of soldier-surveyors into a part of Persian Kurdistan then in rebellion against the central government. As the Kurds were fanatical Muslims some anxiety was felt for detachments commanded by Hindu surveyors. The work was, however, finished speedily and without incident. On being asked afterwards whether he had had any trouble one of the Hindu surveyors

*A reproduction of a revenue survey based on Lambton's triangles, made in 1815-16 on the scale of one inch to a mile, of an area in Madras Presidency. Revenue surveyors confined their attention to features of economic importance, such as the rectangles representing cultivated lands*





*A modern planetabler reading his clinometer. On the plane-table triangulated points are plotted to scale in their geographical positions. The planetabler sets his board so that lines of longitude on it lie in a true north-south direction. By sighting at points visible on the ground and drawing lines through their plotted positions on his board he can determine his own position. He fixes the positions of other points by intersecting lines drawn to them from two or more known positions. Heights he calculates from clinometer readings combined with distances measured on his planetable*

replied with a broad grin: "None at all, the Kurds were most friendly. You see, we took the precaution to adopt Muslim names for the occasion. I was Muhammad Yusuf and my orderly here was Ali Baba!"

The Sikh wars in the middle of the 19th century took British influence right up to the mountains of the North-West Frontier and Kashmir. Surveyors and *khalasis* from the plains of India with no previous experience of mountains or climbing techniques found themselves among the glaciers and precipices of the highest mountains in the world; and for long it was thought that a survey *khalasi*, who mistook his orders and climbed the wrong peak to set up a survey mark, held the world's altitude record.

With the extension of surveys into the great mountain barriers of the north men began increasingly to wonder what lay behind the ranges. The position of Lhasa, the capital of Tibet, was a matter of conjecture and many of the cities of Central Asia had not been visited by a European since the days of Marco Polo. The Chinese government forbade all entry by foreigners into Tibet or any of its Central Asian territories, and the certainty that they would be recognized made it impossible to send Europeans across

the frontiers to explore. Such was the situation in the early 1860s when Montgomerie, who had made his reputation on surveys in Kashmir and the higher Himalayas, conceived the idea of training Indians from the frontier districts and sending them across the ranges to explore. Many such people were of Mongolian descent and might pass unnoticed.

The first subject of this experiment was Pandit Nain Singh, a young schoolmaster from the village of Milam in the Kumaon hills. He was given an intensive training in route-surveying and then set out disguised as a Tibetan lama or holy man. After considerable difficulty he succeeded in crossing the frontier from Nepal into Tibet and reached the river Tsangpo. Here he joined the caravan of a merchant and accompanied him to Lhasa.

As was befitting a lama he walked apart from his companions, apparently lost in his devotions, turning his prayer-wheel and counting the beads on his rosary. Examination would have revealed that the hollow head of the prayer-wheel, instead of containing the usual scroll with Buddhist prayers, concealed a compass and survey data; and the rosary had 100 beads, instead of the usual

108, and was being used to record paces. To check his latitude Nain Singh made star-observations in secret.

After a long stay in Lhasa, where he gained his living by teaching accounts, Nain Singh returned safely to India. His journey had been a triumphant success and had provided the first reliable geographical information about the very extensive area he had covered. Geographers throughout the world hailed his achievement. He was to make two more notable journeys in Tibet before he finally retired from exploration loaded with honours both from the Government of India and from foreign geographical societies.

Encouraged by Nain Singh's success, the Survey of India trained others and sent them out, and the next twenty years covered one of the most romantic periods of exploration in any continent. Known generally as "the pundits" and travelling in various disguises and designated by names such as "A-K", "the Havildar" and "the Munshi", intrepid surveyors crossed the frontiers and penetrated the most remote parts of Central Asia. Some of them met violent deaths, some disappeared never again to be heard of, and all faced very great dangers and hardships. To this day their work provides the only reliable information about many remote areas; and

where modern travellers have been able to check their work they have paid tribute to the reliability of the pundits.

Perhaps the most remarkable tale of these explorers concerns not a surveyor but his servant. Kintup was an illiterate hillman engaged as the servant of a survey-trained Tibetan known as "the Lama". He accompanied his master into Tibet in an attempt to solve the riddle of whether the Tsangpo was the headwaters of the Brahmaputra of Assam or of some river further east. The Lama, however, proved faithless and, after selling Kintup into slavery in a Tibetan monastery, disappeared never to be heard of again.

After a couple of years Kintup escaped, but instead of at once making for safety he resolved to carry out the orders given to his late master. He made his way down the Tsangpo further than any previous explorer and then, when only a few miles from the Assam frontier, finding further progress through the tremendous gorges impossible, he threw into the river logs marked, according to instructions, in a particular way. Only then did he return to India after an absence of four years.

Unfortunately the watchers stationed on the river in Assam had been withdrawn while Kintup was in captivity and his logs

*Lithographic draughtsmen in a map-reproduction office of the Survey of India correcting the zinc plates from which maps are printed. Much of the work is done with a fine brush and demands the highest skill. One man is using a magnifying-glass to do a particularly intricate piece of work*



passed unnoticed. He reported his adventures to the Survey authorities. Being illiterate he had memorized the names of the places through which he had passed, with estimated distances between them. The Survey of India believed Kintup and considered that he had established the identity of the Tsangpo and Brahmaputra; but this view was not accepted by geographers elsewhere; and it was not until twenty years later that his story was confirmed by other travellers and he received belated recognition for his devoted work.

In the course of years the number of activities of the Survey of India has increased and now includes high-precision levelling, tidal observations and the computation of tide-tables and geophysical surveying, which comprises investigations of gravity and the earth's magnetism. Gravity surveys based on its work are being used increasingly in oil exploration, and magnetic survey methods have proved valuable in locating mineral deposits under the earth's surface.

During World War I air photographs were used for making and revising military maps. In 1922-23 one of the first systematic air surveys in the Commonwealth was carried out of flat impenetrable forests in the delta of the Irrawaddy in Burma; and soon afterwards air photographs were being used for mapping inaccessible areas of tribal territory on the North-West Frontier. In recent years, with the great development of air survey techniques and the increased cost of labour and transport, air survey is increasingly taking the place of planeteal surveying; and the Survey of India is now equipped with batteries of the latest pattern machines for plotting maps from air photographs.

During World War II, Survey of India personnel formed the military Survey Service of the Indian Engineers which was responsible for map-production and distribution in the fighting services from Iraq to South-East Asia. In 1941-43 it carried out ground surveys of large previously unsurveyed areas of Iraq and Persia; and later, using air photo-

graphs of enemy-occupied areas, it provided maps for the operations in Burma and other parts of the South-East Asia Command. Behind it the Survey of India, reinforced by personnel and equipment from the United Kingdom, acted as its base for stores and map-production.

With the ending of the war the Survey of India was faced with demands of a new kind. The need to plan for vastly increased supplies of food and hydro-electric power caused the Government of India to turn to the Department as the only organization capable of undertaking the enormous amount of survey work involved in such plans; and since then an important part of its activities has been 'project surveys'. These take the form of large-scale surveys of areas of prospective dam and barrage sites, coupled with medium-scale, closely contoured surveys of large areas for irrigation. New techniques involving air photography and levelling have been evolved.

The partition of India in 1947 and the passing of British rule resulted in the loss of many officers and technical staff and a big reduction in the area of responsibility of the Department. Difficulties were inevitable, but the few British senior officers who remained were gratified to find that the new Government recognized the value of the Department and soon took steps to enlarge it and equip it with the most modern machines for air survey and tide computation. Now it is larger than at any time in its history.

The employment of army officers continues. For long the majority of the senior officers were Royal Engineers, and their connection with the Department did not end till 1956 with the retirement of the last British Surveyor General. Now officers of the Indian Engineers have taken their place; but in the newly designed Survey of India crest, though the crown has been replaced by Asoka's lions, the names of Rennell and Lambton still hold an honoured place. If these giants of a by-gone age could revisit the scenes of their labours and see the Department they founded and shaped they would, I think, feel that the lead they gave was being worthily followed.



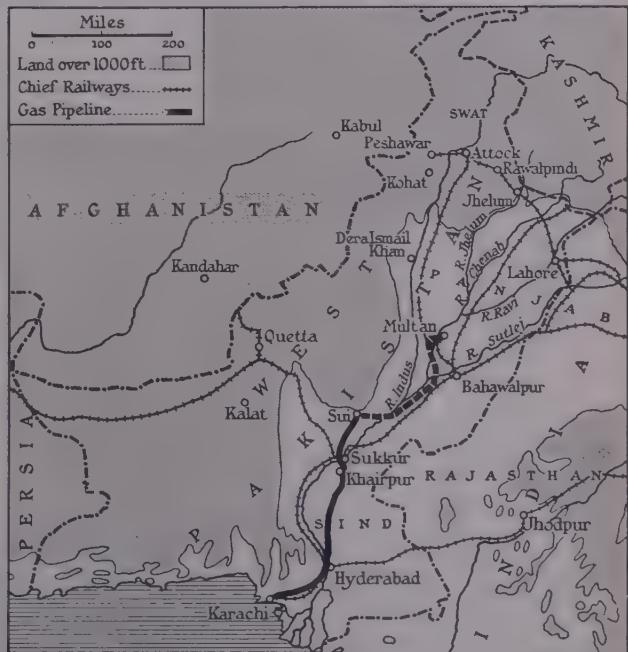
## Pakistan's Natural Gas



By courtesy of the Burmah Oil Co., Ltd

(Above) *A view of the Sui Gas Transmission Company's plant at Sui in West Pakistan.*

While drilling at Sui in 1952, Pakistan Petroleum Ltd found, not the oil they were looking for, but a supply of natural gas at a depth of some 4500 feet which would be sufficient to provide fuel for all the power-driven industries of West Pakistan for the next fifty years or more. By September 1955 a 348-mile pipeline was completed to Karachi and two retail companies had begun to distribute the gas. Already 27,000,000 cubic feet are being consumed each day. A second pipeline, to Multan 200 miles north-east of Sui, is being constructed at the rate of more than a mile a day, and when that is finished (in mid-1958) a further extension will be made to Lahore. Pakistan Petroleum is owned jointly by the Burmah Oil Company and the Pakistan Government (with a few shares in private hands) and is a fine example of the way in which a great industrial concern and a government can operate amicably together.



A. J. Thornton



Training photographs by courtesy of Airwork Ltd



(Above) A helicopter over the booster station near Sukkur which helps to pump the gas from Sui to Karachi. Helicopters are proving invaluable for patrolling the gas pipeline which runs across desert, swamp-land and heavily irrigated rice-growing areas. Maintenance engineers must be able to reach any spot quickly for purposes of supervision, adjustment or repair. (Left) Making bricks for the new town for workers in the purification-plant and on the gas-field. (Opposite, top) Kode Dije fort dominates the irrigated plains on the edge of the Sind desert, some thirty miles south-east of Sukkur. The landscape in the background is characteristic of the grain-growing country through which the pipe runs. (Opposite, bottom) One of seven main canals leading from the Sukkur Barrage across the Indus. Built between 1923 and 1932, it is the largest of its kind in the world and irrigates over 5,000,000 acres





(Above) Laying the Sui-Multan section of the gas pipeline. It will supply many industries in West Pakistan. (Below) Testing insulation: an important safeguard because the gas is highly combustible



# Men and Women of Pakistan

by SIR OLAF CAROE, K.C.S.I., K.C.I.E.

*No other single factor is as important in the life of a country as the character of its people and none is harder to define. Sir Olaf Caroe is qualified for essaying this difficult task with respect to Pakistan by thirty years' residence in many districts now included in its western half, terminating his service as the last Governor of the North-West Frontier Province before partition*

To understand the spirit of Pakistan there is need to grasp that the usual concept, which equates the Muslim world with Arabia, is far too narrow. Islam, as it moved north from Arabia, passed through a Persian prism. The Persian civilization is one of the oldest and most enduring in the world; it is indeed far deeper and broader-based than the inspiration from Arabia which it embraced, in the process taking captivity captive. There is a sense in which all the upland in Asia between Baghdad on the Tigris and Lahore on the Ravi is one country. The spirit of Persia has breathed over it, bringing an awareness of one background, one way of expression, a unity of spirit felt in Shiraz, Kandahar, Multan and, until recently, as far as Delhi and even Calcutta. He who has caught that breath has won to the heart of a mystery. This is the zephyr which blows from the plateau of Iran, a genial air compounded of many fragrances, under whose caress the flowers still expand. In the field of letters the latest garden is to be seen in the writings of the poet Iqbal, esteemed widely as the inspired herald of Pakistan, a dispenser of winged words, whether in Persian or Urdu—that *lingua franca* developed by the Muslim conquerors of northern India on a Hindi basis with a Persian superstructure.

This is not to say that the Arab message of the Quran has in any sense lost inspiration in its impact on Pakistan. The many Arabic words in Urdu, though they came through the Persian, bear evidence to the contrary. It is not that the essential spirit or doctrine of Islam suffered change, but rather that the new revelation, as it passed into settled lands from the desert, was given an emphasis more refined by men already heirs to a much older culture. The metaphor of the prism is perhaps the most suggestive. Light is no less light when it is made beautiful in many colours. It was in this prismatic form that the new radiance was first dissolved within Persia itself, and streamed on into the Turkish lands—first across the Oxus and later to Anatolia in the path of conquest—and also into the

valleys of the Indus and the Ganges. The Pathans too, a people with an East Iranian heritage, turned aside from combat to welcome this same flood of light from Persia.

The Arabs never conquered the sub-continent, save for one corner, Sind, occupied by them in the 8th century A.D. The Muslim conquests of the Indo-Gangetic plain started three centuries later with the raids of Mahmud from Ghazni in what is now Afghanistan, and did not become effective until the time of the Ghurids in 1192. They were achieved not by Arabs but by Turco-Iranians. Even today Karachi alone, with its Sind hinterland, carries the flavour of the Arab principates in the Gulf, so utterly different from that of Lahore with its Central Asian memories. Nor is it imaginary to trace the comparative volatility of the Sindhi to his Arab forebears.

The Moghul Empire, inaugurated in 1526 by Babur (who combined in himself Turkish, Mongol and Persian strains), imposed on most of the sub-continent the stamp of an enduring civilization. This had its springs in the Iranian fountain of Central Asia, but was enriched also by many other streams in the lands of its adoption. The linguistic evidence of their synthesis is to be seen in the Urdu language in its more Persian form.

Not only the Moghuls themselves, but the Turkish and "Pathan" rulers who preceded them, are to be classed as Turco-Iranian, with the emphasis on the second word in this compound. The emphasis here is not so much on ethnic origins—always complex and dangerous to simplify—as on the streams of culture and language. The point is that, though many of the conquerors from Mahmud to Babur were Turks—Babur wrote in Chaghatai Turkish—all had drawn deeply from the Persian well. Such men as Babur could and did write poetry not only in their native Turkish but in Persian. The same is true of the Pathans. Not only is their language, Pashtu, itself an East Iranian language, but a poet like Khushhal Khatak was equally at home in Persian or Pashtu, and his Pashtu

poems are based on a Persian model. Moreover Persian was the language of the Delhi court; Urdu, originally the camp-language, did not supplant it until the Moghul Empire was in decline.

What then are the air and demeanour, the manners and customs of this civilization, and what the inward grace of which these are the outward sign? In looking for these we must search out the true metal, remembering that human character is always an alloy and would be intolerable without its amalgam of imperfect ingredients. There are hypocrites enough everywhere, and in all societies the true coin is balanced by the counterfeit. But the true shines the more brightly for the contrast.

The quality most obvious to the outsider is a notable gravity of demeanour, associated in many minds with the reverence of old age but visible also among the more thoughtful ranks of the young men. None who has met this quality of grave consideration—in old Persian *sanjidagi*—could confound it with pomposness or pride. The Moghul Emperor Akbar was described by Portuguese Jesuits as “pleasant-mannered, intimate and kindly, yet always preserving his gravity and sternness”, and again as “great with the great and lowly with the lowly”. It is that kind of graciousness which comes from a half-conscious but wholly confident sense of balance between self and others, held even by an unquestioning belief in a governing spiritual force. In the everyday exchanges of life it finds its natural outlet in hospitality, that more-than-etiquette as between host and guest, guest and host, which betokens the wish to give and not to receive and is the symbol of the best in human relationship.

Hundreds of men, young and old, are to be met in the guest-houses of Pathan villages today, who stand for this tradition. I remember one most particularly, Khan Muhammad Zaman Khan of Akora, direct descendant of Khushhal the poet in the seventh generation, a most beautiful old man now blind, but still renowned among a race of natural gentlemen for the quiet and simple dignity with which he maintains the style of his ancestors, without a trace of ostentation and winning the respect of all. His guest-house is situated in a delightful spot, looking down the Landai River towards its junction with the Indus at Attock. Like his ancestors he too is a poet who has published books of Pashtu verse which are today widely quoted.

None who met him will forget the late

Sahibzada Sir Abdul Qayyum, the chief architect of that synthesis of Pathan with British democratic practice which enabled a firm foundation to be laid for the political edifice within which the Frontier region eventually took its place as the bastion of Pakistan. In poise and dignity, both of spirit and demeanour, he had no equal in this age. To look at he was magnificent—head splendidly held, strong, clear features, an eagle eye, a bodily presence and gait commanding deference, yet so perfect his manner and approach that he could charm the youngest into the proud belief that he spoke as to an equal.

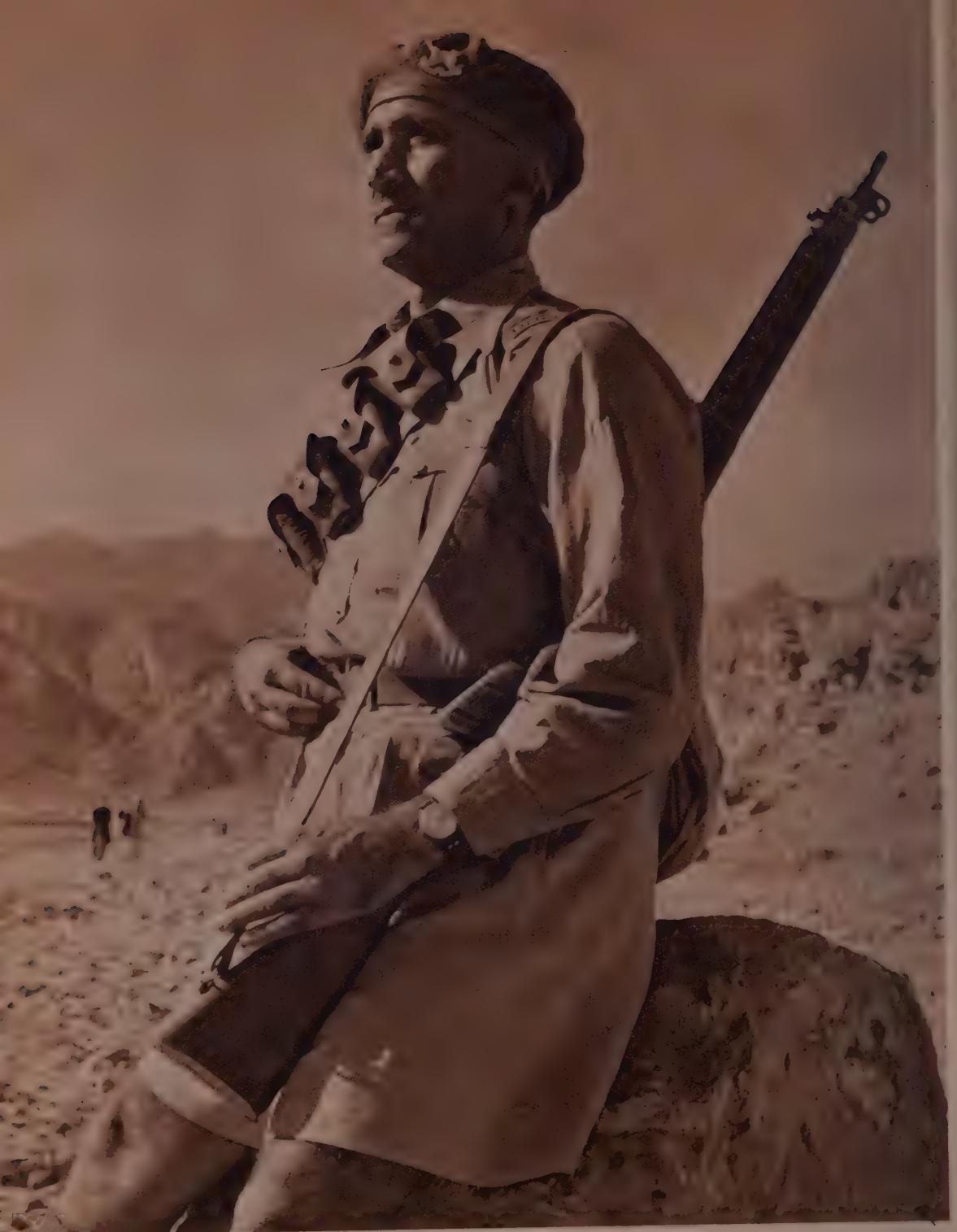
There is another, still with us but retired to a life of seclusion, the Miangul Gulshahzada, creator of Swat State. In 1922 by a most remarkable exercise in statecraft he succeeded in making the lovely districts of Swat and Buner into a coherent State, ruled by himself. A past master in the art of political management of men, one who knew to a nicety the moment to seize whether in statecraft or in battle, resolute in action, free of all cant, like Akbar formally illiterate, yet, again like Akbar, blessed with a prodigious memory, he set to all around him a pattern of leadership, temporal and spiritual, hard to equal in the annals of any country.

By his own will the Miangul spends his last years in contemplation, and has left his son, Jahanzeb, to rule the State, under Pakistan. A graduate and a master of English, wearing Western dress as to the manner born, a fine debater whether in *jirga* (tribal assembly) or in parliament, Jahanzeb is outwardly the antithesis of his father. But the simplicity, the courtesy, the tough fibre of the family is in him, and he will not fail. In himself he has been able to mingle two strains of manners, in the sense that these make man; or (it might be truer to say) to demonstrate, quite unconsciously, that *sharafat*, or nobleness, knows no distinction of creed or people. He is *sharif* just because he has no proud looks. And that, perhaps, is the secret of the ideal among Muslims. For Islam means submission, and should exclude pride and vainglory, intellectual or other. Vanity is recognized as a false value.

Then there is the technologist, the industrialist also. The man I remember best in the first role—for doctors are technologists—is Colonel Afzidi, son of an old friend, Sharbat Khan, and a most brilliant worker in the field of medical and health research and administration. Fitly enough he takes his



*A Pathan tribesman, representative of the Turco-Iranian compound that is the backbone of West Pakistan*



courtesy of the High Commissioner for Pakistan

*The Pakistani soldier is a volunteer. He comes from and returns to the village*

*His father is a farmer, a man whom no toil can tire nor failure of harvest dismay*

*Ian*





*courtesy of Sir Olaf Caroe*

*The late Sahibzada Sir Abdul Qayyum, first Premier of the North-West Frontier Province: "poise and dignity, both of spirit and demeanour"*

*Khan Abdul Ghayyur, a Pathan in Pakistan's Foreign Service, shares with most of his compatriots the character of "a friend with whom one can laugh"*

lan





*courtesy of Pakistan International Airlines Corporation*

*Pakistani women are quickly coming into their own . . . even as air-hostesses*

*They are the mothers and sisters of a people notable for their good looks*





Courtesy of the High Commissioner for Pakistan

*The Bengali Muslim is a man of subtle mind, with a compelling gayness and spontaneity*

name from almost the most famous of all the Frontier tribes; his family belongs to the Adam Khel section of Afridis who inhabit the Kohat Pass. He is a malarialogist of international reputation; he can get things done and build on slender foundations; above all, like most of his people, he is a friend with whom one can laugh, boisterously or with wistfulness. And then there is Faruque, another with a delicious sense of humour, who came to the Pakistan Ministry of Industries in its early days and whose constructive work as Chairman of the Development Corporation has been responsible for much of the remarkable progress of recent years.

All these are Frontiersmen, or of families that have lived for generations among Pathans, far from the centres of Moghul culture in the heart of the sub-continent. I have spoken of the Moghul tradition, kept alive even after the fall of the Empire by the descendants of Viceregal houses. Bengal was one of the richest of the Moghul Provinces, and one of the Viceregal families there was that of Murshidabad, to which Surajuddaulah, Clive's opponent at Plassey, belonged. From this same family comes General Iskander Mirza, President of Pakistan. Like all the *Umra* (nobles) of Moghul times the Murshidabad Nawabs lived in the assigned part of what was then India but were not of it; in their case they were rulers in Bengal but not Bengali Muslims. Their tradition was and is Iranian, and they have often revived it by taking wives from Persia. They have even maintained the use of the Persian language in their homes. The President is no exception. The insight of his peers, who chose a man in the true line of Moghul aristocracy as their first Head of State under a 20th-century Constitution, is hardly to be regarded as fortuitous. It is the best possible evidence of the enduring character of the material with which Pakistan is built.

But in, and (this time) of, Bengal there are more Muslims than in the whole of West Pakistan combined. These millions differ from their compatriots in the West in that the Westerners are to a large extent the descendants of invaders from beyond the Passes, while the Easterners are mostly of Bengali origin, indigenous to the soil, having embraced Islam during the many centuries of Muslim rule over the northern plains of what was then India. Among them still live a large minority of Hindus. The Bengali Muslim is a man of quick and subtle mind, formidable in argument and perhaps in some

respects more akin to the Muslims of Malaya and Indonesia than to the Iranian tradition of Central Asia. I cannot claim to know him well. But he has in him a certain gayness and spontaneity which is compelling, and Pathan friends have told me that Khwaja Shahabuddin, who was two years Governor at Peshawar, was undoubtedly a more devoted and sincere man of his faith than almost any Pathan.

The most eminent Muslim from Bengal at the present time is Shaheed Suhrawardy, the Prime Minister. His family is also of *Umra* rank. I have met him only once—that once not nearly enough, and in a relaxed moment, on the beach at Karachi. He delights in people and in social gatherings, and is utterly devoid of any self-conscious postures. There is a most infectious glee and liveliness in all he does, a sparkle that makes you wish to be his friend. In politics this alacrity gives him that quality of insouciance without which no statesman in these days can expect long to survive. This is a quality which will put him on equal terms with the introversions of his formidable opposite number in India.

It was for reasons of this kind that Begam Ikramullah, wife of Pakistan's High Commissioner in London and Shaheed Suhrawardy's cousin, was so successful at a U.N. session when she crossed swords with her Indian antagonist in debate. Her quick flashes of gaiety and repartee were in marked contrast to the endless homilies of her rival, and all who heard her felt she had been able to send a shaft of light shimmering to disperse a cloud of equivocation. No less a feminist than Lord Pethick-Lawrence once described her as a statesman, an educationist, a lecturer, a writer, a broadcaster, and, not least, the mother of four children. To hear Begam Ikramullah speak is to plan to hear her again; to know her is to realize the potential contribution to affairs in the gift of the women of Pakistan.

Nor is it mainly in public life that Pakistani women are taking a new place and belying those ancient concepts of the purdah system. As the active wives of civil and military officers, as social workers, as members of a Naval Reserve, as nurses, secretaries, stenographers and even as air-hostesses, Pakistani women are quickly coming into their own. Two women more different in themselves can hardly be thought of than Miss Fatimah Jinnah, sister of the Qaid, and Begam Liaqat, widow of Liaqat Ali Khan; yet each after her manner has been largely instrumental in the

breaking down of an excessive orthodoxy and in the emancipation of her sisters.

There are probably few peoples in the world with a higher average of good looks than the Panjabi and Pathan men of the North. It is not surprising then to find that their mothers and sisters are endowed with a grace and beauty that can catch the breath. But—one plea here!—a sophisticated taste will prefer the fashions of Paris or Bombay to the unbecoming *qamis* and *shalwar* of the North, a dress in which even the greatest beauty must lose her radiance.

In West Pakistan there is one type which will always win renown—whether Panjabi or Pathan does not matter much, for in this case they are much alike: the soldier. He comes mainly from the Salt Range or the adjacent Frontier districts; sometimes, if a Tiwana or a Khatak, he may wear his hair long to the ear, smoothly combed, and held with wooden clips. He is tall, lithe and spare, his eye is clear and straight, and “he looks like a lance in rest”. He may be a *sipahi*, or in these days a general, or even a Commander-in-Chief. He comes from the fields of Jhelum, Rawalpindi, Hazara, Kohat—one field or a hundred makes no matter, he will be the same man. Or if he himself is not a farmer, his father was. He may be seen in the regiments or at the Staff College, and a very proper man he is. General Ayub Khan, the Pakistan Commander-in-Chief, is not ashamed to belong to this vintage; his ancestry goes back to the Tarins, the elder brothers of the Abdalis in Kandahar, but his family have been settled in Hazara for generations.

Then there is the cultivator of Upper Sind or Multan—let us call him Ibrahim—a long, lean man whom no amount of toil or exposure seems to tire. Things are better now, but time was when the working of inundation canals was subject to the caprice of the height and duration of the Indus floods and the set of the river. Too often had Ibrahim been unable to cultivate because the flood came too late or too low; too often had he sown hopefully only to see his crops wither and die. Yet there was the year when by the mercy of Allah the great river changed its course, and left adjoining his fields a wide accretion of rich soil which under the rules of alluvion became Ibrahim's own property. It was right to praise God for his grace, and to work on even at the cost of debt. And so straightforward was Ibrahim that it never occurred to him that the asset which enabled him to do this was not his land, so precarious and difficult, but his own honesty and reliability. It

was not for him to repudiate his debts, or go and work elsewhere.

There are many others, not themselves soldiers or cultivators, who have been born and bred on the broad acres of the Indus and Panjab riverain. Such are Maliks Khizr Hayat Tiwana, once Premier of his Province, and Firoz Khan Noon, now Pakistan's Foreign Minister. Of all these it can be said:

Of courtesy, it is much less  
Than Courage of Heart or Holiness,  
Yet in my walks it seems to me  
That the Grace of God is in Courtesy.

No picture of contemporary Pakistan can be complete without the figure of another Pathan, Dr Khan Sahib. And if the charge is that these Pathans of mine are too much in evidence, the answer must be that they are the Scots, the Highlanders, of Pakistan and as such destined to high and honourable place in the state. The force of Pathan character, the courage of the Pathan soldier, the shrewdness of Pathan assessments of political reality, more than once carried their fathers to the throne of Delhi. The same qualities will tell in Pakistan.

Dr Khan was my Chief Minister in Peshawar in the last years before partition. I was often at odds with him, and the times were very difficult. But never could one doubt his principles or his patriotism. And always even disagreement was brightened by touches of sincerity or whimsy, sometimes mingled, and always coloured by a flash of the eye or a disarming smile. After partition the Doctor suffered constraint for a number of years on account of his principles, but a few years later he re-emerged as the first Premier of the “one-unit” Province of West Pakistan.

For the moment the changes have been too quick for him, and the politics of Lahore too tortuous, even as those of London must have seemed a skein too twisted for the men of James I to unravel. But he, a Pathan, held this position for a year at the most difficult time and that, for Pathans, is good augury. And the end is not yet.

If I am asked what is the chief characteristic of the men and women of Pakistan, I should reply—their forthrightness. They admire the forthright in themselves and others, and we in Britain should do well to remember it. Here speaks the Turk in that Turco-Iranian compound. With this equipment a new state, founded on an old and cherished tradition, may face and overcome the challenges of this modern world.

# India's Economic Ambitions

by GEOFFREY TYSON, C.I.E.

*Every nation in Asia and Africa is eagerly bound for one goal: equality in technical development with the Western world. Of the roads leading to it, the Communist one promises speedy attainment, but at a terrifying price. Independent India has chosen a different road: a way of her own. Her first steps along it and some pitfalls ahead are herein described by Mr Tyson, who was Editor of Capital, Calcutta, from 1932 to 1952 and is Secretary of the India, Pakistan and Burma Association*

INDIA's Second Five-Year Plan is now fifteen months old. This ambitious programme of economic development, which grew out of the remarkably successful First Plan, is a far more difficult one to carry through than its predecessor. The First Five-Year Plan (1951-56) was really a bringing together of a number of industrial and agricultural projects which were already well under way. Indeed, some dated back to the days of the pre-independence administration. So that in one sense much of the First Plan was already a going concern which had acquired considerable momentum when Mr Nehru's government took it over as a working programme for economic development and prescribed the attainment of certain targets for investment, production, etc. Generally speaking those targets were fixed at modest levels. The fact that in most cases they were attained in the prescribed period, with a comfortable margin to spare, engendered a rising mood of confidence and the feeling that the country was capable of a much bigger effort. Furthermore, in 1947 India had accumulated very large sterling credits which represented deferred payment for services and goods supplied to the Allied armies—particularly to the British command—during the war. These gave her easy access to the foreign exchange she required for various planning projects and seemed to promise that the country would not be short of external purchasing-power for a very long time to come. It is true that in the immediate post-war years there was a world-wide shortage of capital goods, but throughout the period of the First Plan all seemed set fair for a big advance and in drawing up the Second Plan the authorities were encouraged, by the evidence then available, to prescribe a development programme much in excess of anything that had been attempted in the 1951-56 period.

During the years of the First Plan I had many opportunities of seeing its tonic effect

at first hand. Wartime food and cloth shortages were overcome; great multi-purpose schemes, such as the Damodar Valley Corporation which combines irrigation and power projects, were taking shape; air and rail communications were extended; rural improvements were going ahead; technical training schemes had begun to operate and there were obvious signs of a new and purposeful spirit. Behind the scenes the officials of the Ministry of Planning worked with a rare spirit of dedication and devotion to duty. One had the feeling that though much was being done, the economy was still functioning well within itself and that the country could, if pushed to it, call on substantial reserves of energy. I suppose the planners, with their much more detailed knowledge of the situation, felt that too and it may have induced in them a certain over-confidence about the future.

The First Plan was a very even mixture of state and private enterprise and though steady progress was being made I suspect that about the middle of the Plan Mr Nehru and his close advisers began to ask themselves: Is our rate of progress good enough? About this time, too, Mr Nehru visited China and I recall that he returned to India greatly impressed with the speed of Chinese development, though not necessarily with its content. One soon began to hear thoughtful Indians making unfavourable comparisons between their own country and China and asking whether in fact India was progressing at a pace fast enough to enable her to overtake the basic problems of poverty, illiteracy, disease and mass unemployment, particularly unemployment amongst the middle classes. Others were inclined to think that in spite of her efforts India was really rather like a man travelling the wrong way on an escalator—just about able to hold his own against the moving staircase. In India's case the moving staircase is the remorseless increase in population and the unremitting struggle to match



*Photographs, except three, by courtesy of the Press Information Bureau, Government of India*

Among the schemes which took shape during India's First Five-Year Plan was the great Damodar project. Begun in 1948 to develop agriculture and industry in the area west of Calcutta, it comprises coal-fed and hydro-electric power, flood-control, afforestation and even fish-breeding! Irrigation will cover 950,000 acres. (Above) The Bokharo power-station. (Below) One of the seven multi-purpose dams



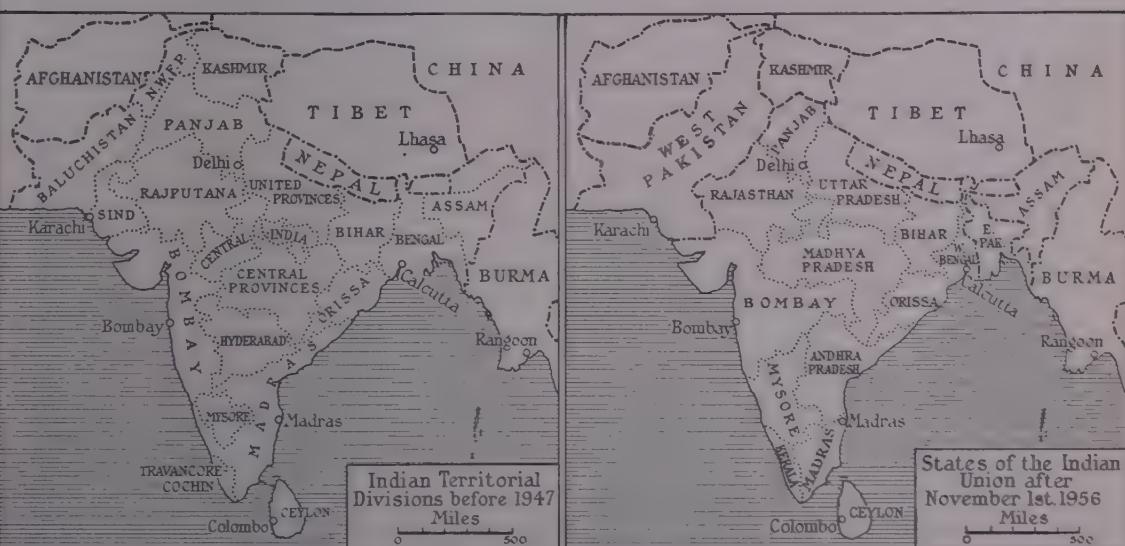
insufficient resources with ever-mounting responsibilities. However, the plain fact is that we have come to the end of a phase in India's planning and the authorities are obviously assailed by doubts about the future. I use the word "we", because not only Indians but intelligent people all over the Free World have been watching this great experiment in democratic planning with interest and sympathy and not a little anxiety. Indeed, in many respects the Indian Plan has been looked upon as a pilot scheme from which the other "under-developed" countries might learn.

Recently, for the first time, doubts have begun to be heard about India's ability to carry through her Second Five-Year Plan; more significantly the doubts are heard loudest of all in India itself. This is a complete change of mood; a year ago a few senior civil servants and business men might have had their mental reservations which they mostly kept to themselves, but it would have been the grossest heresy for a politician of any party to question the feasibility of the Plan. What has happened to cause this abrupt change of front?

The root of the trouble is, I think, that the Second Plan has been drawn up on the basis of India's needs rather than on a realistic calculation of her resources. This is not the place to embark upon a discussion of complicated monetary techniques, but a brief reference must be made to the financial assumptions of the Plan if we are to understand how it has

reached its present critical stage. Taking the public (or state-owned) and private sectors of the economy together, a total investment of resources of all kinds amounting to Rs 6100 crores (£4,575,000,000) is necessary to carry the Plan to completion in the period 1956-61. This is very big money, but one has to concede that even if the whole of this investment was made it would only raise the annual *per capita* income of the average Indian from £20 15s. to £24 10s. In calculating the finance available, the Planning Commission found there was a shortfall of no less than Rs 1600 crores (£1,200,000,000) after taking credit for pretty considerable sums to be raised by way of loans and new taxation. To meet the shortfall it proposed that there should be what is called "deficit financing" amounting to Rs 1200 crores and that the uncovered gap of Rs 400 crores should be taken care of as means come to hand.

It may well be that this gap can be bridged by deficit financing, which is a polite euphemism for the printing of currency notes by the Reserve Bank of India. But the size of the Plan and the extent of the reliance upon this form of finance and upon borrowing by government from the central banking system undoubtedly raises the prospect of inflation. In all fairness, it must be said that the authorities have so far succeeded in keeping this particular spectre at bay. There is no way, however, in which the easy mechanism of currency creation, used to fill a domestic short-





Courtesy of the Burmah Oil Co., Ltd

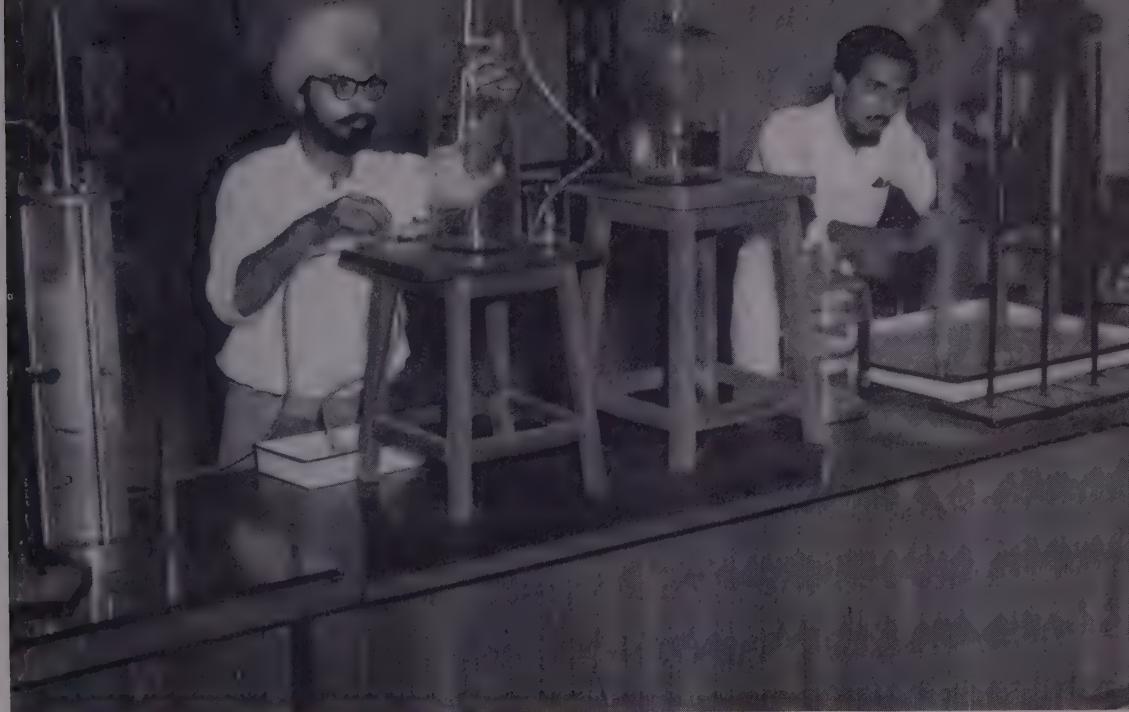
*Private enterprise has provided an essential basis for India's Five-Year Plans, though whether this goose will be allowed to continue laying golden eggs remains to be seen. (Above) The Assam Oil Company's refinery at Digboi, in India's only oil area, where drilling was commenced in 1889*

fall, can be turned to the task of filling an external gap. Only foreign exchange earned by exports or borrowed can do that; and when the Second Plan was drawn up it was estimated that India's foreign exchange requirements fell short of resources by at least Rs 800 crores (£600,000,000). Since then, for various reasons, the figure has increased by perhaps another £150,000,000, whilst India's drawings on past reserves have greatly accelerated in recent months. Despite special measures to correct the situation she is, in fact, scraping the bottom of the barrel so far as foreign exchange is concerned. This is the root cause of her present difficulties and may well call for a revision of the Plan targets or an extension of the Plan period—or both.

Though many Congress Party politicians argue that neither of these courses is possible, for myself I hope and believe that the men at the very top will be sufficiently wise to accept the need for some readjustment of both the targets and the time-table of the Plan. For, even in the face of serious foreign

exchange difficulties, much can be done. Take the simple matter of housing: anyone familiar with the Indian scene knows that both rural and urban housing is, by and large, deplorable. Only too often men, women and children live huddled together in conditions that are barely civilized and, outside such places as the slums of Naples, have no parallel in the Western world. A vast national housing programme could, I guess, be carried through without the expenditure of much foreign exchange. Certainly a great deal of rural rehousing could be undertaken from local supplies of bricks, mortar and wood, none of which call for any foreign exchange outlay. (Urban residences and blocks of flats require steel which is in short supply in India, though the position should be easier when output from the three new state-owned steelworks begins to supplement the production of the existing companies.)

Such a housing programme would in very short time give India a new look and would go a long way to raise living-standards, which is



*Training of technicians is integral to the Plans. (Above) Indian chemists studying road materials at the Central Road Research Institute, Delhi. (Below) Indian technical skill is also made available to the peasant in his village through the Community Projects: cattle being inoculated against rinderpest*





*In a country whose population is increasing by 10,000,000 every year any development plan must include ways to step up food-production. (Above) India is perennially short of rice, a staple food. (Below) Crossing varieties of rice for heavier crops: the Five-Year Plans stimulate such research*

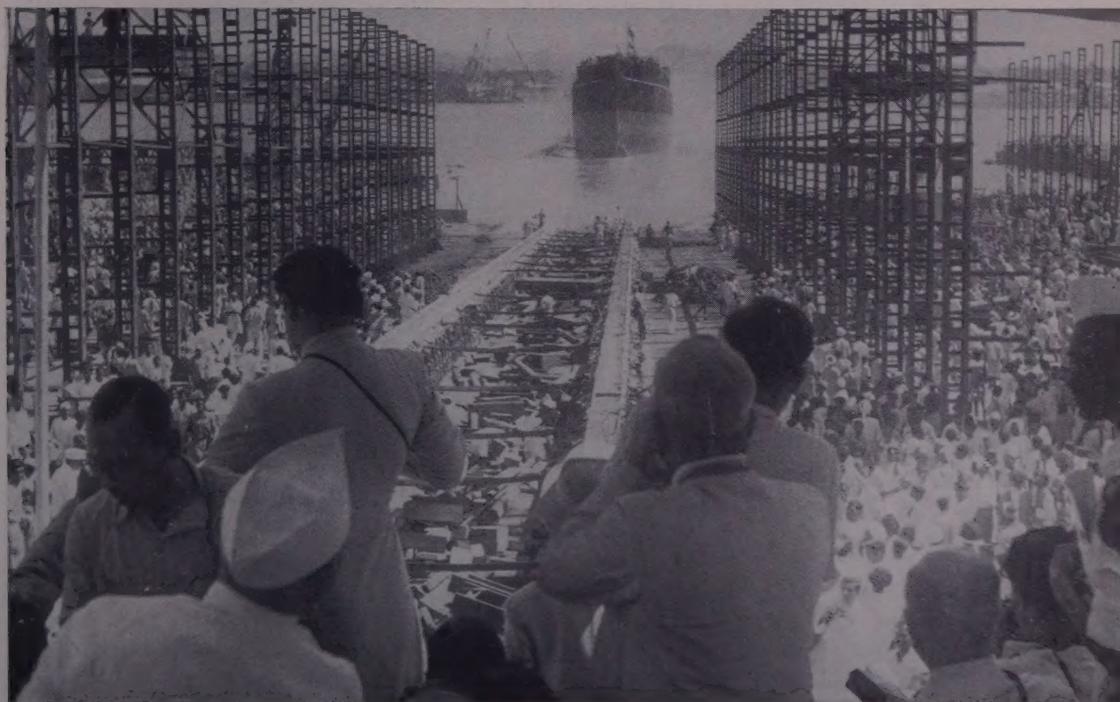




R. C. Groeger

(Above) India's age-old maritime tradition is represented by the 'country boats' which still ply around her coasts but most of her overseas trade has long been carried by ships of other countries.

(Below) In 1948 Mr Nehru launched the first ship to be built in India for her new merchant fleet





C. Groeger

(Above) The slums of India have few parallels in the Western world and rehousing schemes are seriously hampered by the increasing population and shortages of some building materials. Nevertheless progress is being made. (Below) Wherever opportunities exist Indian architects are taking advantage of them





*Mr Nehru, the Prime Minister of India, signing the Second Five-Year Plan at Delhi on May 14, 1956*

the main object of the Plan. In a planned society the provision of what the economists call "social overhead capital" is the business of the state; private industrialists in India are unlikely ever again to be able to create such up-to-date townships as Jamshedpur, which was erected round the Tata Steel Works, or Digboi which the Assam Oil Company hewed out of the virgin jungle.

But, of course, neither more housing nor more concentration on improved agricultural methods is likely to make any serious impact on unemployment which represents the hard core of the Indian problem. As a general rule the more employment a new manufacturing unit or a new industry can provide, the better it is from India's point of view. In a country which is deficient in capital but has an immense surplus of labour, the latter is more readily expendable. Relative to its capital cost an oil-refinery (India has three new ones and a fourth under consideration) provides remarkably little additional employment. The great problem is, in fact, to strike the right balance between the outlay of scarce capital and the new opportunities for employment it will bring with it. My own

feeling is that perhaps not enough thought has been given to this very difficult point, which is really epitomized in a typical decision as to whether one is going to use earth-moving tractors for a job and get it done in seven days or employ, say, a thousand labourers with picks, shovels and head-baskets and take three-and-a-half weeks. The tractors cost foreign exchange, while the labourers can be paid in rupee currency. Other things being equal I would plump for the labourers and the longer working-programme. But, happily, I do not have to make such decisions.

That kind of example, however, does not dispose of the more difficult question of unemployment amongst the educated middle classes. Not so long ago I motored from Cochin to Calicut along the coast of what is now the State of Kerala (still perhaps better known to the outside world as Travancore-Cochin). Kerala has the highest percentage of literacy in all India. In village after village one encountered bands of young men and women making their way to schools and colleges and it was not surprising that one also saw more hammers and sickles and

Communist slogans plastered on walls than anywhere else in India. Very largely because of middle-class frustration and discontent the March general elections resulted in the return of a Communist Government in Kerala. One cannot discern much evidence of the beneficence of the Plan in this State, where a highly intelligent middle class is quite impotent to create worthwhile employment-outlets for itself. Some people profess to see the Communist accession to power there as a portent and a warning for the rest of India. We must wait and see, bearing in mind that very similar conditions exist in West Bengal, where Communism has also gained some ground in State elections. The ability to cut into the solid mass of educated middle-class unemployment presents the Plan with its supreme test. There is the further fact that hitherto middle-class education has had too much bias towards the arts and has offered too little encouragement to science and technology. In a word, trained and specialized manpower is almost as scarce as investment capital. But energetic measures are being taken to redress the balance.

From the little I have been able to say in the compass of a short article, it will be clear that India's Second Five-Year Plan has now run into some quite sizeable difficulties. Equally, it has to be said that the Plan has already reached a stage from which no retreat is possible—at least from major objectives. Some ruthless trimming of the frills is both possible and desirable and, in my view, will almost certainly prove inevitable. But so far as the top-priority projects are concerned—new steel-works, railway and port extensions, coal and oil development schemes—both Government and people have reached 'the point of no return'. Vast sums of money have been committed to these ventures in the past few years and if it is not to be wasted they must be brought to completion. Clearly, that is what the Finance Minister, Mr T. T. Krishnamachari, had in mind when he told Parliament recently that he thought they would be able to carry through "the core of the Plan". He said "some re-phasing of the Plan is inevitable", adding "it would be prudent for us not to make fresh commitments for some time until the outlook becomes clearer and we have more assurance of being able to find the foreign exchange resources needed".

A pronouncement of this kind does not mean defeat, and no-one should interpret it as such. For India is wedded to the idea of economic planning in a way that few people

in the free-enterprise West can understand. It is the be-all and end-all of policy. To the younger generation it seems to gather together all their hopes for the future and for their elders it is the symbol of independence and a new way of life.

In all sections of the community there is much unreasoning impatience to secure quick results. Though understandable, this is not, I consider, the best mood to set out on a long haul—for a long and exhausting journey lies ahead of all who are participating in the Plan. If one studies the great periods of development associated with British rule in India (and there were such) one cannot fail to note the many setbacks that accompanied big programmes of railway-construction, land-reclamation, the establishment of new industries and the like. Admittedly conditions were different; but even in relatively modern times it took something like twenty years satisfactorily to launch public works such as the Sukkur Barrage or the Back Bay reclamation in Bombay. The giant Tata Steel Works very nearly foundered on more than one occasion in its early days. India is trying to telescope into a few years industrial growth that took generations in Western Europe.

But, it will be argued, India cannot wait for the most favourable tides and winds; her population is growing too rapidly and fresh hungry mouths are coming along to be fed at a rate which brooks no delay. That, of course, is the darkest side of the picture and one of which the country's leaders are only too painfully aware as they seek to match needs and resources. The authors of the Second Five-Year Plan would have been fools if they had overlooked the need to try to restrain the growth of a population of 357,000,000 which is multiplying at the rate of about 3 per cent per annum. And so family planning has begun in a small way, though many prejudices and obstacles still have to be overcome. One of the most remarkable manifestations of the new Indian spirit is that there is a perceptibly growing demand for knowledge about family planning and the means to achieve it. This demand is a curious by-product of a Plan which, to the outsider, would seem to be predominantly economic in content. But it is not too much to say that it is yet another piece of evidence that the philosophy of the Plan has begun to permeate every department of life and that, though it may suffer some changes as time goes on, it will continue to enshrine India's most cherished hopes.